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News of the Industry Begins Page 418

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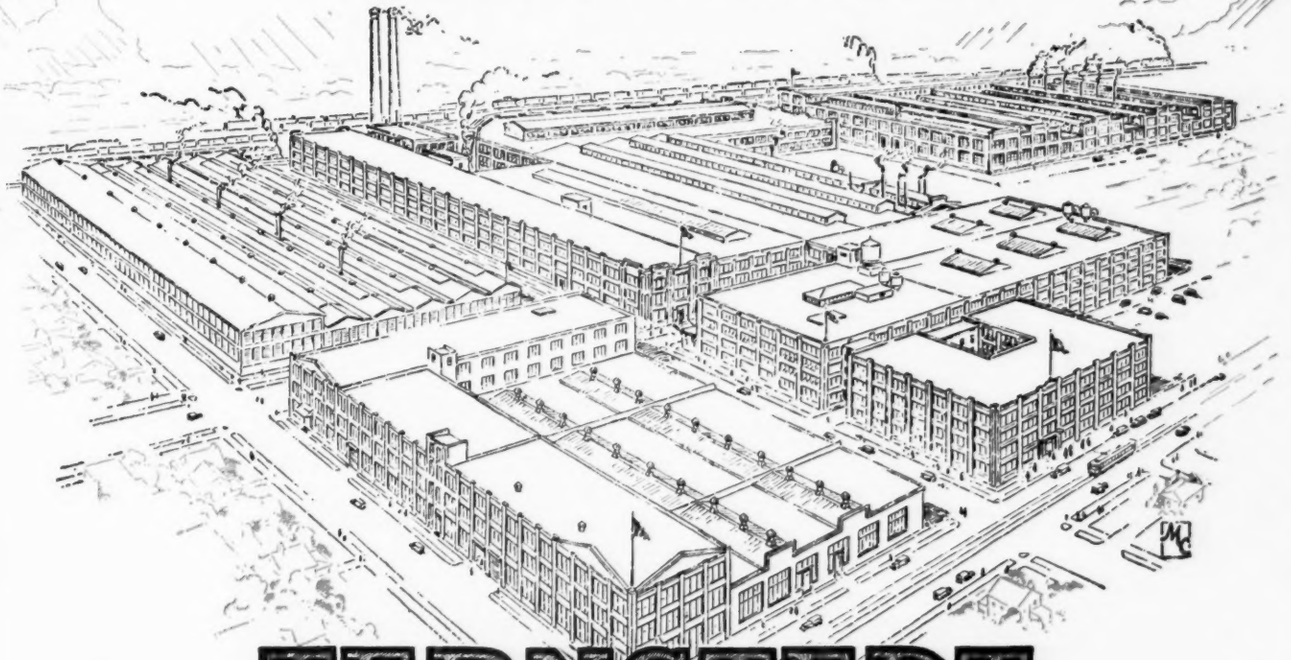

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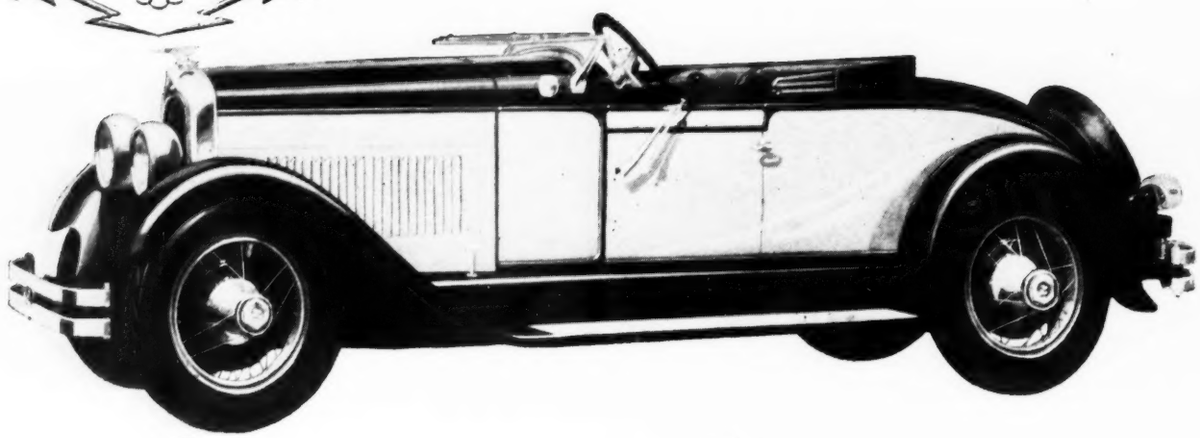

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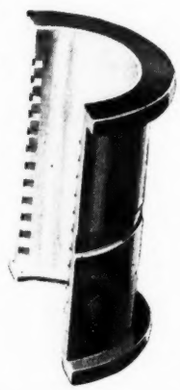

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AUTOMOTIVE INDUSTRIES
VOLUME 56 *Philadelphia, Saturday, March 12, 1927* NUMBER 10

Car Manufacturers *are* Improving Parts Distribution Methods

More attention given to this phase of business in recent months. Nearly all companies have increased outlets by granting discounts to independent garages.

By Donald Blanchard

THIS article is based on a recent investigation of parts distribution methods which extended to practically all car-producing companies. It tells how the car manufacturers are going about the business of building up their sales in this field.

To find out how the car builders have fared in respect to replacement parts business during recent years it is necessary to bring the activities of the independent parts makers into the picture, and this is done in a manner that gives the reader a clear idea of the entire situation as it stands today.

THE volume of replacement parts business done by some car manufacturers has undergone a very severe relative shrinkage since the war. One company which has enjoyed a phenomenal increase in production during that period had about the same dollar volume of parts sales in 1926 as in 1921. Undoubtedly this is due in part to better design and materials and improved manufacturing and it is so interpreted by this factory. Reductions in parts prices also have had an effect. Parts sales of another manufacturer, when expressed as a percentage of gross volume, are now less than half what they were six or seven years ago. It is difficult to justify a shrinkage of this magnitude wholly on the grounds of improved design, material and manufacture.

The independent parts maker has become a tremendously important factor in the replacement field and the services he has provided have helped materially in keeping cars running. It seems probable that the successful competition he has been able to offer, is at least as largely responsible for the losses sustained by the car makers as any other factor. This view is supported by estimates of nation-wide sales of replacement parts and supplies made by the Commercial Research Department of the Chilton Class Journal Co. These estimates indicate that in the years 1921 to 1926 inclusive, sales under this heading have formed a fairly constant percentage of new vehicle sales. The minimum percentage is slightly more than 20 while the maximum is about 23½. The obvious conclusion is that the replacement parts market is growing at about the same rate as new vehicle sales, and not at a greatly decelerated rate, as the sales records of a number of important car makers would indicate.

More attention is being paid to parts distribution by the car factories. Very evidently the methods in vogue six or seven years ago no longer serve the market as it wants to be served and, if any of the ground that has been lost is to be regained, new methods must be adopted. Moreover, with competition for new car business becoming increasingly keen, it is becoming more and more important to develop all potential sources of profit to the utmost.

At one time, the independent parts maker selling the service field direct was regarded quite generally by the car factories more or less as a parasite on the industry and was frequently characterized as a pirate or a gyp. This antagonism undoubtedly grew out of experiences factory parts managers had in dealing with irate customers who had been cheated with inferior parts. Natural forces have practically eliminated the dishonest parts maker and an overwhelming majority of the independent makers now in the field are supplying parts of high quality backed by guarantee. Factory parts departments quite generally recognize and many parts executives are frank to admit that the independent maker is filling an economic need which the car maker

has not heretofore supplied for a variety of reasons.

The independent shop expects the parts supplier to provide convenient buying sources, prompt service and adequate discounts in addition to quality. The requirements of the car dealer who must buy parts to recondition a car of competitive make taken in trade, are approximately the same.

Independents Get Discounts

All but one of the factories included in a recent investigation of parts distribution policies have authorized their dealers to give independents a discount on parts, the range of such discounts being from 10 to 25 per cent. In some cases this discount is also open to competing car dealers although usually this is left entirely to the dealer to adjust locally. A summary of the discounts given follows:

Five give 25 per cent.
Three give 20 per cent.
Two give 15 per cent.
One gives 10 per cent.
Three make discount optional with dealer.

The conditions under which the discount is given vary considerably. Some factories recommend that it be given to all independents while others limit it to selected shops which are known to be reputable and to do good work. These shops usually receive an identification card. In some cases it is necessary for the dealer to agree to maintain the list price and to use genuine parts exclusively in the particular make of car covered by the agreement. The latter feature is included so that the independent will not use his discount privileges to cover purchases of slow-moving stock and buy his fast-moving parts elsewhere. Administration of this feature would seem to offer some difficulties as it would necessitate the car dealer's keeping a check on the sales made to each independent to see that he is buying the high turnover items as well as the slow-moving parts. Two factories make the granting of a discount to independents a part of the dealer's contract.

Just what might be considered an adequate discount is open to question but some competent critics believe that anything under 20 per cent will not prove a sufficient inducement to the independent shop in view of the discounts offered by competitive parts makers unless, of course, other considerations overshadow this element in importance. One manufacturer who recommends a discount to the garageman stated that 95 per cent of his distributors were giving one but that the dealer's margin on parts did not allow him to do so. This condition exists in other cases and, of course, tends to counteract the factory's recommendation that a discount be given.

Promotion Left to Dealer

Promotion of the sale of parts to independents in most cases is left largely to the dealer or distributor. How much can be expected from the dealer along this line is questionable as he is frequently inclined to take the view that the independent is a competitor and that by granting him a discount, he is hurting his own service business. This is a natural and human reaction although there are plenty of facts to prove that it is unwarranted. Nevertheless it does exist and has considerable influence on the distribution of genuine parts. The extent to which the car factory can go in promoting the sale of parts is a debatable point as a stage is reached at some time where the cost of getting the additional business is not warranted. Probably this consideration is in some cases responsible for the fact that factory parts selling efforts do not go beyond the dealer and frequently reach only the distributor.

A few factories, however, are sending representatives right to the independents. When Chevrolet inaugurated its new parts policy it sent direct mail advertising to every independent shop in the country and had factory men follow up the replies. As a result, about 3000 independent shops were lined up and are now functioning as retail outlets for Chevrolet parts. At the other end of the price scale we find Cadillac with about 2500 such outlets which have been signed up by factory men working with the distributors.

Although, in each case, the number of shops receiving discounts represents less than 10 per cent of the nation's 40,000 independent shops, these additional outlets are resulting in increased volume and they constitute a substantial addition to the service facilities of these two companies.

The car owner has demonstrated that he will buy maintenance where it is most convenient for him to do so and that who makes the parts used by the shop he patronizes is not an important factor. As long as the work is up to standard, he is satisfied to let the shop act as his parts purchasing agent.

Car Builder Has Advantage

On the score of geographical distribution and number of outlets, the larger car manufacturers at least have the advantage of the independent parts makers as each car dealer is potentially a local parts wholesaler. However, the car dealer has never shown any great interest in parts distribution while the wholesaler or subdistributor of the independent maker has the scale of replacement parts as his primary interest. Consequently he performs this function more effectively. He contacts with his trade regularly and goes to length in satisfying his customers that the car dealer possibly can not be induced to do. Perhaps it is not practical for him to. Moreover the independent's countermen are trained salesmen who know how to handle trade with a courtesy that builds good-will. One car factory executive believes that ultimately it will be necessary for his company to provide training courses for parts salesmen along lines now provided for car salesmen, if the car dealer is to become a real local wholesaler of parts.

Provision of fast parts service of the character furnished by the independent's wholesaler, also presents its problems in the car dealer organization. Frequently the dealer's parts department is not convenient to the street and often the interior arrangement of his stockroom and his stockkeeping methods are not as good as they might be. However, the car factories are educating their dealers on this phase of their businesses and improvement may be looked for.

Probably a considerable proportion of the car dealers have enough money invested in parts to enable them to give prompt service but in many cases they are not able to do so because the assortment has not been well selected. Most of the factories visited have prepared model assortments for dealers of various sizes and these undoubtedly will help to correct the situation. In the matter of obsolescence, some provision is usually made for the dealer to return parts which do not move although the conditions under which permission is granted to do so, vary widely. Usually a handling charge is made on such returns in addition to the transportation charges.

It seems doubtful that any material changes in sources of replacement parts supply or in the channels through which they flow to the owner, are to be expected. Certain car manufacturers undoubtedly have expanded their parts business by adopting more aggressive methods but even in these cases only a small proportion of the total retail outlets for service parts are being reached. Car makers unquestionably can do a better job of parts distribution than they have been doing and very likely will do it, but because of the practical difficulties with which they are faced, the independent probably will not be affected materially by this more active competition. In fact, it is likely to be a good thing for the business as a whole as it will force more efficient performance on everyone concerned with the distribution of replacement parts.

N. A. C. C. Resolution Praises Work *of* Col. Clifton

THE appreciation of the National Automobile Chamber of Commerce for the able guidance and leadership which Col. Charles Clifton exercised over its affairs during the many years that he served as president, has been expressed in the form of an official resolution adopted by the Chamber.

Col. Clifton became president of the Chamber in 1904 when it first began its association work in the industry. His tenure of office continued unbroken until last week when the Board of Directors, yielding finally to his wishes, accepted his resignation. Roy D. Chapin of the Hudson Motor Car Co. was elected in his stead.

The resolution, which eulogizes the character of Col. Clifton as well as the manner in which "for a quarter of a century you have borne the responsibility of leadership," was made public this week. It follows:

"NATIONAL AUTOMOBILE CHAMBER OF COMMERCE TO COL. CHARLES CLIFTON:

"Your election to the principal executive position of our governing body was almost coincident with the birth of the automobile industry.

"For a quarter of a century you have borne the responsibility of leadership, without challenge, without an adverse comment.

"During all those years you have meant more to us than a mere performer of official duty. You have exercised not merely the formalities of your office, but have been confidant, adviser and personal friend alike of successful and struggling participants in the industry.

"Your attitude toward your fellow members has been the outcome of your rare ability to visualize and sympathize with the viewpoints of others and this characteristic has been largely responsible for your unselfishness and generosity even to those who have been your most ardent competitors.

"Your belief in the possibility and desirability of considerate and kindly relationship between competitors in business has been an important influence in maintaining that cordiality between members of the N.A.C.C. which has made possible the attainment of our position as leading exponent of that which is best in the work of trade organizations.

"You have always shown in marked degree ability to grasp and sum up the probable effects of difficult situations, and have given, unsparingly, and with the best interests of all of the industry in view, of the results of your conclusions, the soundness of which has been amply demonstrated.

"You have made yourself not merely respected but beloved by all those who, during the years of your activity, have been participants in the industry of which you have been so outstanding a figure.

"Naturally, therefore. we have long resisted your desire to retire, and we now yield to your earnest request with a deep sense of the loss we are to sustain and with remembrance that never, under your long administration, has any situation arisen within the family circle of the Chamber that might be dignified by the title of a controversy.

"Mindful of the loss and appreciative of the qualities herein sincerely described, we take such measures as are possible to retain the advantages of your association with us by electing you to the Honorary Presidency of the N.A.C.C. and to perpetual honorary membership of its Board of Directors."

How *a* Material-Handling Problem *is* Solved *by* Goodyear

Electric trucks and several types of conveyor employed to move 160,000 lb. of material an average distance of 1925 ft. daily and are synchronized for continuous production.

By K. W. Stillman

THE job of moving 160,000 lb. of material an average distance of 1925 ft., or, expressed in more common terms, of providing nearly 30 ton-miles of transportation, is the daily load imposed upon the material-handling system of one of the Akron plants of the Goodyear Tire & Rubber Co.

The types of equipment used for this work and, particularly, how the various parts of the material-handling system are synchronized to permit continuous production should be of interest to all automotive men who commonly are confronted with similar problems.

This load is, in general, handled by two distinct types of material-handling equipment. In the first stages of production electric trucks are employed to move the 160,000 lb. of material, in about 800 loads, a distance totaling about 800 ft. Then conveyors—over-head, belt and roller—are employed through the remainder of the processes.

In this plant, which is devoted to the production of small size tires, the average daily production is between 20,000 and 25,000. To make these tires, about 100,000 lb. of crude rubber and 60,000 lb. of fabric are required, in addition to considerable quantities of miscellaneous materials such as compounds.

Crude rubber is received from freight cars in bales weighing from 2000 to 2500 lb. and in order to facilitate handling of these very heavy bundles a roller conveyor, gravity operated, has been installed in the receiving department platform. As the bales of rubber are brought out of the freight car they are placed on this conveyor and carried to storage.

Lift Trucks and Skids

From storage the crude rubber goes to strippers where the tightly packed bales are pulled apart for more easy handling. Electric lift trucks and skids are utilized for this purpose, the same skid being generally used for a single batch of rubber from the time it comes into the plant until it is impregnated into the fabric. The distance of this first journey is about 200 ft.

From the strippers, after washing and drying, the cleaned rubber makes a short trip of about 100 ft.—still on skids—to the compound room where the various materials which will fit the finished product for its particular service are added.

After compounding, the batches of rubber—weighing between 700 and 900 lb., and contained in sheet metal batch boxes—are carried by electric truck to the mill where the mixture of rubber and compound is thoroughly mixed. This trip is one of about 500 ft. and about 125 loads are carried for a day's production.

From the mills the rubber is carried to the calenders, a distance of about 200 ft., where it first meets the fabric. In all these movements of the crude rubber two electric lift trucks are employed.

The fabric is received in huge rolls about 3 ft. in diameter, 5 ft. long and weighing about 400 lb. To handle these rather unwieldy loads two electric trucks fitted with small cranes are provided. An axle is thrust through the roll and its two ends are hooked to chains suspended from the crane, which then picks up the roll, moves it to its destination and manipulates it while it is being placed in position in the calender.

Truck Crane Used Again

After the rubber has been forced into the fabric by passes through the calender the rolls are taken by another small truck crane to the cutting department located near the calenders. In this department the wide band of fabric is cut into plies for the tires and other types of fabric are cut into the proper sizes for breaker strips, beads, treads and the various other parts of a tire.

Directly behind the cutting department is a continuous conveyor, running at a speed of about 60 ft. per min., and having several hundred racks suspended from it. Each one of these racks contains pegs to hold all the material needed to make a single tire—an average of 11 pieces. As the cutters finish a particular piece they simply turn around and place it upon a vacant peg of a rack designated for the particular size and type of tire they are working on. Each of these conveyors, of which there are several in the plant, has space for 220 complete sets of tire material.

The conveyor carries the cut pieces alongside the tire makers who operate the machines which are used in the actual construction of the tire. Each builder picks off from the conveyor as it goes past him a rack containing material for a tire and replaces on the conveyor the empty rack which contained material for the tire he has just completed.

The number of racks provided on the conveyor has been determined with reference to the number of tire builders served by the conveyor and by the output of the cutting department so that it is very unusual for a tire builder not to have a filled rack available when he

needs it or for there to be a lack of empty racks to receive newly cut pieces.

High over the heads of the tire builders is a second conveyor provided with hooks and when a tire is finished it is tossed over one of these hooks and carried several hundred feet to the first inspection post.

After passing this inspection the tire enters upon a rather complicated journey on various sorts of conveyors which finally land it in the curing pits in the basement of the plant. The first stop is to receive airbags which are inflated inside the tire during the period it is being cured. This station is very closely correlated with another conveyor bringing airbags from tires which have been cured so that as an uncured tire arrives at the station a deflated airbag arrives at the same time for insertion and inflation.

The curing pits are arranged in rows of two and a roller conveyor occupies the space between them. A continual stream of tires passes slowly along this conveyor. The curing pits are sunk into the floor so that their tops are just slightly below the conveyor level. A movable platform supported by a hydraulic ram is lifted to the top of the pit. A short movable conveyor and a block is so arranged that the tires, as they come along the main conveyor, are shunted off and roll by gravity onto the movable platform where two men quickly adjust them in exact position. The ram operates so that the platform is lowered at a steady pace which is just fast enough to allow one tire to pass below the upper rim of the pits as the next one comes sliding down the conveyor.

Once the operation is started the pits are filled almost automatically and while one is being filled a second is being made ready. Thus the steady stream of airbagged tires down the conveyor and into the pits never ceases. The number of pits served by a single conveyor, the speed of the latter and the length of cure necessary are all correlated so that a continuous process is made possible.

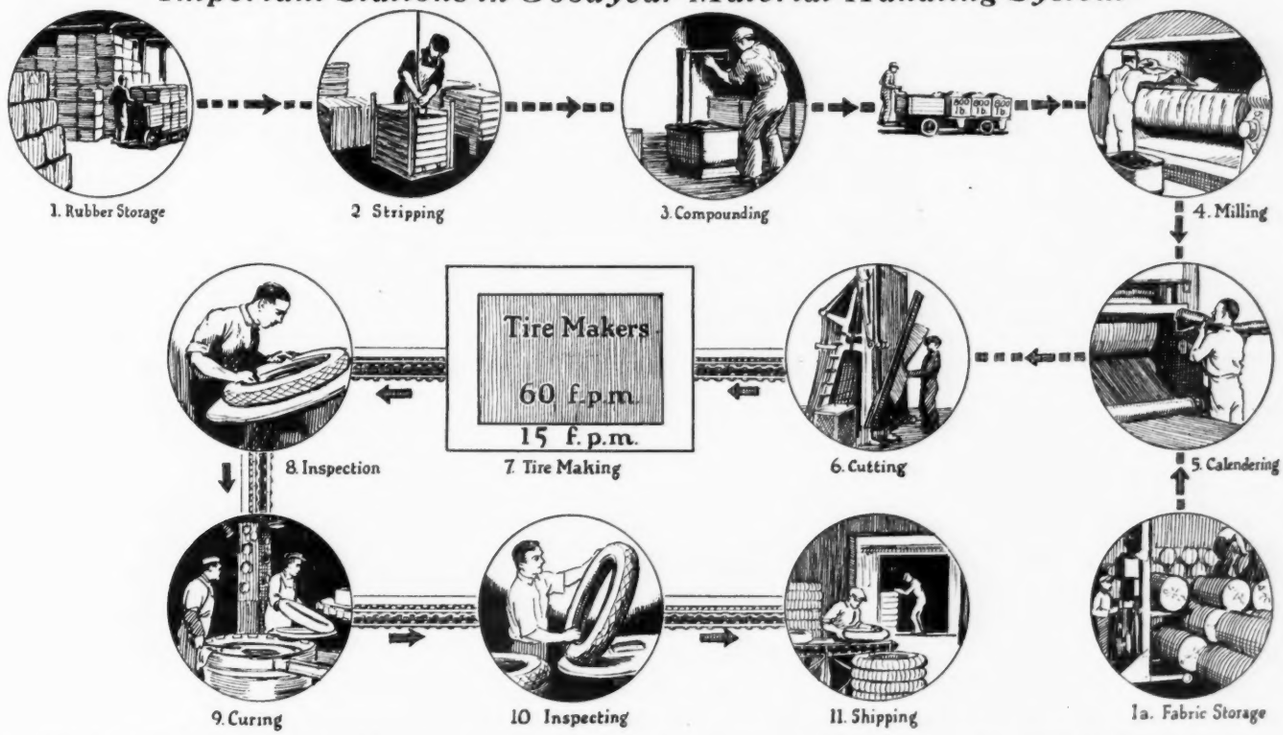
After the curing is completed the pits are emptied in almost reverse order. The ram slowly forces the movable platform upward and each cured tire, as it appears, is shunted to the same conveyor which brings the uncured tires to the pit and which carries them on to the stations where they are stripped of airbags, the latter being sent back to the production line and the completed tires forwarded to the final inspection.

Total Travel of Tire 800 Ft.

The total travel of a tire from the time it leaves the tire makers until it arrives at final inspection is about 800 ft., 500 ft. of which take it to the pits and the remainder from the pits to final inspection. This movement is by no means as simple as has been indicated here since there are numerous auxiliary conveyors which are provided to care for possible congestions, to provide needed materials and equipment and for other purposes.

The whole handling system, particularly about the pits, gives the casual onlooker a sense of vast confusion but in tracing the course of the raw materials through the plant it is evident that this confusion is only on the surface, that in reality the capacity, type and speed of each element in the system have been determined in relation to all influencing factors and that the movement throughout the productive process is, with few exceptions, continuous.

Important Stations in Goodyear Material-Handling System



About 100,000 lb. of crude rubber are taken daily from (1) to (2) on electric lift trucks. Unit loads are 2,000-2,500 lb. Distance moved is about 200 ft. From station (2) to (5) unit loads are 700-900 lb., still carried on electric lift trucks. Total distance covered is about 800 ft. From (1-a) rolls of fabric weighing about 400 lb. are carried about 200 ft. to (5) and from there about 100 ft. to (6) by means of electric trucks equipped with small crane hoists. From station (6) to (11) the movement is by conveyors of various types. At (7) the tires are formed. Total distance from the tire-making department to the shipping department is about 1,000 ft. Unit loads vary from a single tire to a tire fitted with canvas airbag and cast-iron mold

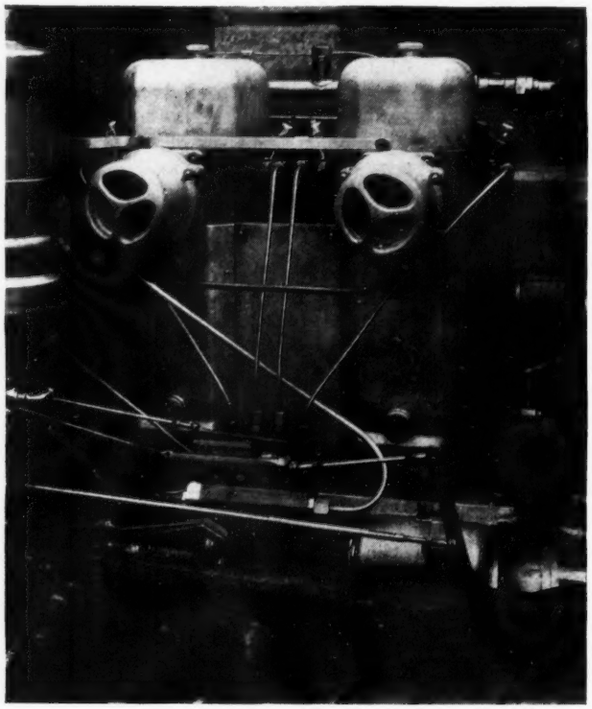
Robert Bosch Co. *to* Manufacture Oil Fuel Injection System

Will supply engine builders with pump and injector valves developed under patents of Acro company. System as applied to M.A.N. engine to be shown here.

By P. M. Heldt

THE Robert Bosch Co., of Stuttgart, Germany, some years ago became interested in the development of the oil-burning engine for automotive purposes and secured an exclusive license under the patents of the Acro company of Kussnacht, Switzerland, which first exhibited its Diesel high-speed engine in New York during the spring of 1923. Since that time development work has been going on continuously, and a great many different types of apparatus have been tried out.

The Bosch company plans to manufacture the fuel pump and injector valves or atomizers. These parts require the same sort of precision work as magnetos and the company's long experience in the manufacture of ignition apparatus therefore specially fits it to turn them out. The Bosch company undoubtedly also realized that if the oil engine should conquer a considerable section of the automotive field it would seriously cut into the demand for magnetos and spark plugs, and by getting into the oil engine field at an early date it is therefore casting an anchor to windward.



M. A. N. Diesel-type truck engine with Acro-Bosch equipment

The patents of the Acro company cover other features of oil engines besides the pump and the injector nozzle, and the company plans to license engine manufacturers and to supply them with the parts mentioned, the same as it is supplying engine manufacturers with magnetos and plugs at the present time.

One of the latest engines to which the Acro system has been applied is that of the M. A. N. truck, which is equipped with a Diesel engine in the first place. Owing to the somewhat higher maximum pressures developed in the Diesel as compared with the carburetor type engine, more rugged crankshaft and connecting rods are required, and the M. A. N. engine therefore probably lends itself better to the application of the Acro system than the average carburetor type truck engine, though in the past the system has been applied also to that type.

The M. A. N. truck, which will shortly be demonstrated by the Robert Bosch Magneto Co. of New York, is of comparatively low build, the chassis having been designed more particularly for omnibus use. As a truck it has a load capacity of 3½ tons. In the unloaded state the truck weighs 11,000 lb. Owing to the fact that the chassis was designed primarily for omnibus purposes, the rear axle reduction is comparatively small, 4.85:1, so that high speeds are attainable. With its Diesel engine converted according to the Acro system the truck is capable of a speed of 25 m.p.h. on level road when carrying a load of 3 tons. The truck is equipped with four-wheel brakes and with an independent emergency brake acting on the transmission.

The engine has four cylinders cast in pairs—a sectional view of the M. A. N. engine was shown in *Automotive Industries* of March 25, 1926—and works on the four-stroke cycle. It has a bore of 4.53 in. and a stroke of 7.10 in., giving a piston displacement of 458 cu. in. At a truck speed of 25 m.p.h. the engine turns at 1100 r.p.m.

Airless or solid injection is used, and the fuel is injected directly into the combustion chamber, through injector valves which are normally closed and which open at the proper time under the pressure of the fuel. The pressure of injection is only about 900 lb. p. sq. in., but it is claimed that by reason of the special arrangement of the combustion chamber very efficient combustion is assured and the engine is unusually flexible and shows great "tenacity" at low speeds.

The engine can be idled down to 350 r.p.m. and can be operated under a load at as low a speed as 400 r.p.m. In the photographic view of the engine herewith the two large cylindrical members in the foreground are the air inlets. Back of the inner three-armed spider is arranged a spiral coil of wire which serves to help in starting the engine in cold weather. When it is desired to start the engine under such conditions from cold, current from the battery is sent through the coils for half a minute or so, which heats up the air entering the cylinders during the first several revolutions, thereby increasing the temperature at the end of the compression stroke and making ignition more certain. Starting is effected by the usual electric starter. While starting and idling the engine fuel is entirely cut off from one pair of cylinders, as it has been found that under this condition it is easier to maintain the temperature of the working cylinders.

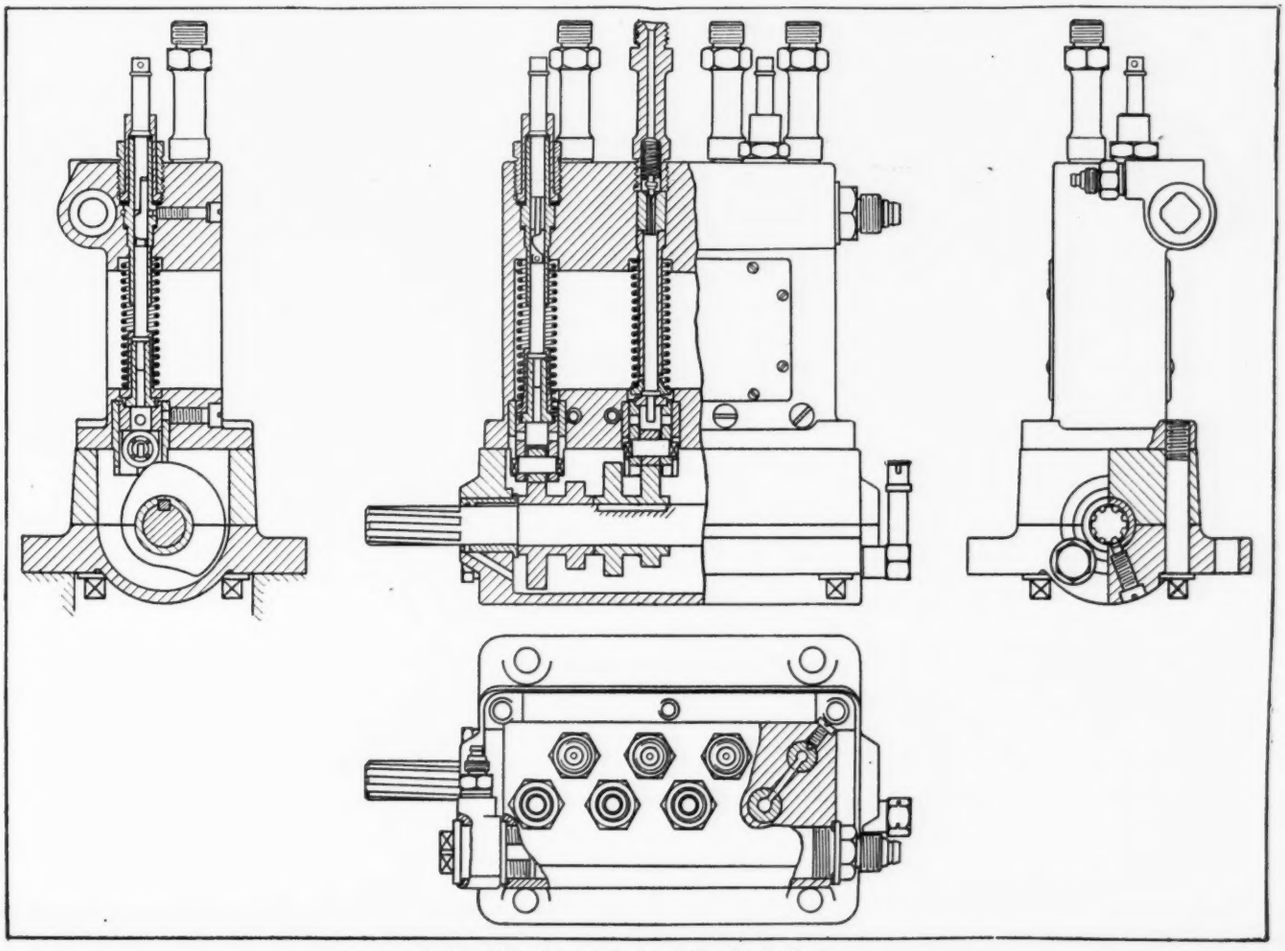
In normal operation the maximum pressure during combustion is limited to about 550 lb., which is not much higher than the compression pressure and also not much higher than that attained in high compression carburetor type engines. The fuel used in this engine is a gas oil free from asphalt, of a specific gravity of 0.88, or 27 deg. Be. This fuel has a heat value of 18,000 B.T.U. per pound.

Fuel consumption tests made on the M. A. N. truck prior to its shipment to New York showed that under varying operating conditions it will do on the average 10 miles per gallon of fuel, as compared with 6.5 miles per gallon of gasoline consumed by a truck of the same weight but fitted with a carburetor engine. The chief advantage from the fuel standpoint, however, resides in the much lower price of the gas oil. Aside from the savings due to the use of a cheaper fuel and the reduced consumption, the elimination of practically all fire hazards is an advantage of no mean importance in certain lines of work.

No tests of this engine to determine its maximum power were made before the shipment of the truck to New York, as it was desired to mount the engine as soon as possible on the chassis and determine its behavior under actual operating conditions. This seemed permissible in view of the fact that the Bosch company previously had fitted a considerable number of single and multi-cylinder stationary test engines with the Acro equipment, and had had in operation for more than a year another truck of 4-5 tons capacity, which originally was fitted with a Diesel engine of the ignition chamber type that was converted to the Acro system. This truck in the meantime has covered 4800 miles. In addition the Robert Bosch Co. also converted a four-cylinder gasoline truck engine into an Acro engine.

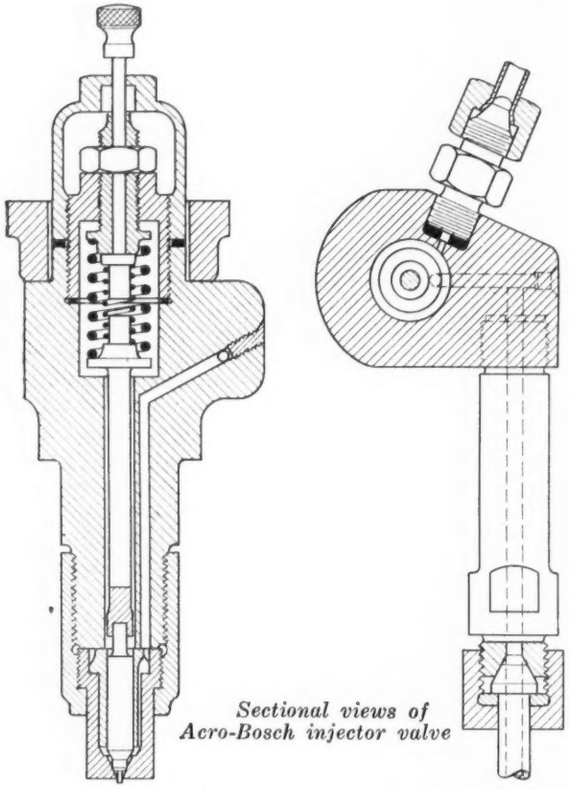
In all of the tests on both stationary and vehicle engines it is said to have been found that the nozzles, inlet and exhaust valves and the piston rings remain permanently in good condition, free from carbonaceous deposits. Combustion is clean and the free motion of these parts is not interfered with.

Within the inlet nipple is located a choke valve, which is about half closed in starting. It consists of two superimposed slotted disks which move relative to each other. It has been found that this choke facilitates ignition at starting. It also prevents violent explosions during



Assembly views of Acro-Bosch fuel pump

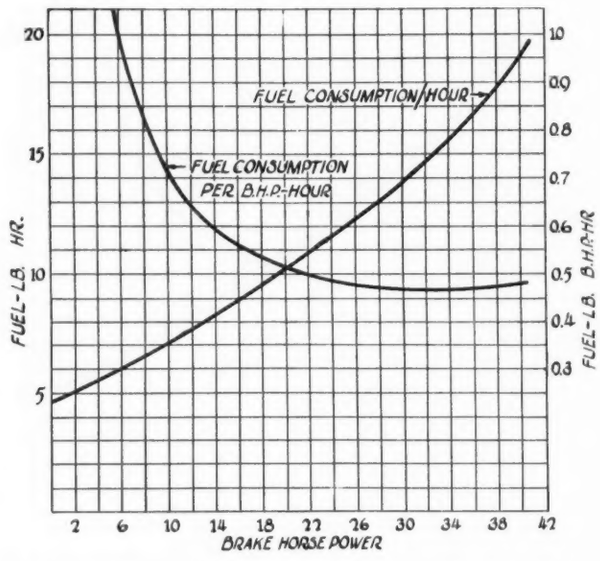
starting, and in addition can be used in coasting down long grades. The weight of air getting into the cylinders is then less and the result is a higher combustion



Sectional views of Acro-Bosch injector valve

temperature and higher wall temperatures, which favor ignition.

A number of assembly views of the fuel pump are shown herewith. It is a quadruple pump with four pump barrels and four valve cylinders parallel thereto, all in the same block. Both the four pump plungers and the four piston valves are actuated from a single camshaft, which is offset equally with respect to both sets of bores. The pump is driven from the front end gears of the engines through a centrifugal governor and through a timing coupling. It will be noticed that the camshaft is cut with splines at a slight helical angle, and by shifting the coupling along the shaft the timing of the pump can be advanced or retarded relative to the cycle of the engine.



Fuel consumption of M. A. N. truck engine with Acro-Bosch equipment

Each pump plunger at its lower end carries a roller which rides on the cam. The cylinder barrel is not formed by the block itself but is in the form of an insert which is held against angular displacement by a set screw, as clearly shown in the sectioned portion of the end view. Attention may be called to the long guiding surface for the pump plunger and to the fact that the plunger positively lifts the discharge valve from its seat when approaching the end of its upward stroke. The discharge valve also acts as a check to prevent the withdrawal of fuel from the pipe leading to the injection nozzle when the pump is on its suction stroke. Return of the plunger is effected by a coiled spring.

Passing now to the piston type of inlet valve, which is shown in two of the views, it will be seen that this also is operated from the cam through a roller and returned by a spring. Fuel enters the pump through a tube connection near the top at one end and flows through drilled passages to each of the four inlet valve cylinders, which are inserted bushings. The inlet valve is provided with a collar with inclined upper and lower edges and variable width, and the valve is so timed relative to the stroke of the plunger that for a certain part of the delivery stroke of the pump plunger the passage between the valve chamber and the pump barrel is blocked by the collar on the valve. During the down stroke of the pump plunger the valve is open and fuel is drawn into the pump barrel. During the first part of the up-stroke the valve remains open and the fuel flows back freely through the inlet valve. Then the valve is suddenly closed and as long as it remains closed the plunger forces fuel into the cylinder through the atomizer.

Valve Action Can be Varied

The length of time relative to the duration of an engine cycle that the valve remains closed can be varied by turning the valve piston around its axis. An extension of the valve which does not interfere with its reciprocating motion projects from the pump on top, and is provided with an arm from which connection is made to the accelerator pedal.

A sectional view of the injector valve is also shown. The fuel enters near the top and flows through a drilled passage toward the lower end. The guided portion of the valve being larger in diameter than its seated portion, there is a differential pressure action which lifts the valve and causes the fuel to be injected past a tip on the valve, which is supposed to favorably influence the spraying action. The lift of the valve is limited by a stop in the upper portion. Fuel that may leak by the injector valve stem into the chamber in the upper part is drained off through a tube clearly shown in the drawing. The small pin projecting from the top of the atomizer is a feeler. By pressing against this pin with the finger, thereby compressing the light spring holding it up, the action of the injector valve can be "felt" and any irregularities in the action of the pump or of the valve detected. Ordinarily the injector valves are secured in place by means of a flanged collar which is slipped over the upper portion of the valve housing and is secured in place by two studs and nuts.

The pumps and injector valves fitted to the M. A. N. engine, as well as all of the pumps and atomizers for all other experimental Acro engines, were manufactured at the Stuttgart works of the Robert Bosch Co., where such parts shortly will be in regular production.

Just Among Ourselves

Liability Insurance Without Compulsion

IN the midst of current arguments about compulsory automobile insurance, we have been particularly interested in a proposal made recently by E. C. Stone of the Employers Liability Corp. before several state insurance federation meetings. After pointing out some of the disadvantages of the Massachusetts law in particular and of compulsory legislation in general, he propounds the idea of evolving a penalty, burden or incentive as a result of which automobile owners will see to it voluntarily that they take out or are protected by automobile liability insurance without the necessity of a compulsory law on the subject. Something of this kind has been done in connection with workmen's compensation insurance in some states, he points out.

* * *

Deprive the Owner of Use of Car

THE specific suggestion along these lines which Mr. Stone makes is as follows: "Deprive the automobile owner of the use of his car upon the highways of the state in which the accident occurred—that is, prevent his car from being thereafter used by anyone—if he or any person using his car with his expressed or implied consent was solely to blame for an accident, unless and until the owner put up some security for the results of that accident." If the owner already has a liability policy, under Mr. Stone's suggestion, the court would accept it as adequate security. Mr. Stone's entire discussion of the compulsory insurance question, together with his whole interesting presentation of the idea above outlined in tabloid form appears in an insurance magazine, *The Federation News* (published in Detroit), of February, 1927, and seems to us well worth reading by automotive executives at the present time.

* * *

Many Companies Must Increase Unit Profit

STUDY of the final detailed production figures for 1926 serves to emphasize again very strongly that the manufacturer's chief current problem is finding ways and means of getting adequate profit without operating his plants at 100 per cent capacity. The cry of "More profit per unit" will have to replace the old one of "More units for profit" if a large proportion of car builders are to continue past successes into the future. Just about half of the passenger car producers succeeded in building as many cars in 1926 as they did in 1925. There's food for thought in that statement, in view of the fact that 1926, as everybody knows, was a record-breaking year and one of general prosperity. Even so, increased volume over the previous year was achieved by only 50 per cent of the individual companies in the business.

* * *

Heavy Slump in Fourth Quarter

THE fourth quarter last year, of course, put a terrific crimp in the output totals of many makers. In 1925, schedules in many plants for the fourth quarter exceeded those of the third quarter. But not so last year. Only a very few companies—among them Chrysler, Cunningham, Marmon and Pierce-Arrow—seem to have built more cars in October, November and December of 1926 than they did in the three preceding months. All through last year, by the way, the makers of high-priced cars seem to have done uniformly well so far as production totals are concerned. Only two or three really high-priced cars appear in the list of those which failed to have as high an output in 1926 as in 1925, while among those who did go over the top appear such names as Cadillac, Cunningham, Lincoln, Locomobile, McFarlan, Packard, Peerless, Pierce-Arrow and Stutz.

* * *

High-Priced Cars Sold Well Last Year

LAST year a total of nearly 71,000 passenger cars sold for more than $3000, as against slightly less than 61,000 the previous year. As a matter of fact more cars were sold for over $3000 last year than in any previous year. This cannot be said of the 1926 sales of cars in any of the other price classes. The table shown on page 231 of our Statistical Issue is particularly interesting from this standpoint.

* * *

Largest Output in Second Quarter

AS usual, the second quarter in 1926 accounted for the largest proportion of the year's output, while the last quarter was the smallest. The first three quarters, however, were unusually even, while the last quarter was unusually small. Here's the way—approximately—that the output was divided last year: First quarter 26 per cent; second quarter, 29 per cent; third quarter, 28 per cent; fourth quarter, 17 per cent. Ford built about 16 per cent of his total output in the fourth quarter, while the rest of the industry built about 18 per cent of its total in the fourth quarter. The prospects are that production will be a bit more evenly distributed during the present year, our guess being that the last quarter will account for more than 19 per cent of output for the year.—N.G.S.

Direct Drive is Combined With New Continuously Variable Gear

Wear thus reduced on mechanism brought out in France under name of L. C. B. Operation is explained.

A NEW continuously variable positive change gear has been brought out in France under the name of the L. C. B. Realizing that the mechanism of such a gear is subject to considerable wear if it operates continuously while the car is in motion, the inventor has combined a direct drive with the variable gear mechanism. The following description is abstracted from *La Vie Automobile*.

Consider a mechanism such as represented diagrammatically in Fig. 1. A gear wheel *C* meshes with a planetary pinion *S*. On the axis of the latter is fulcrumed a lever *L*, the free end of which carries a sliding shoe sliding in the circular groove *R*. A ratchet device permits the planetary gear to turn in the direction of the arrow, without carrying the lever along with it, and locks it if it tends to turn in the opposite direction. For the sake of simplicity in explaining the functioning of the mechanism we will call the assembly of planetary pinion, lever and ratchet device the selector.

As long as groove *R* is concentric with gear wheel *C*, shoe *M* remains at the same distance from center *O* and there is no change in the angle *a*. Under these conditions, if the axis *P* of the selector is given a rotary movement around center *O* in the direction of arrow, the whole mechanism will rotate as a single unit, for the reason that the selector cannot turn around its own axis, being locked by the lever, whose angularity remains constant. The gear wheel *C* therefore turns at the same regular angular speed as the axis *P* which is being acted on.

Groove in Eccentric Position

Now suppose that the groove *R* is moved into an eccentric position with relation to gear wheel *C*, as shown in Fig. 2. Points *P* and *M* then no longer describe concentric paths. While point *M* moves away from point *O* the angle *a* increases, and vice versa. The angle therefore passes through a minimum when points *O* and *M* are closest together and through a maximum when they are farthest apart.

If now the axis *P* is again moved around *O* in the direction of the arrow, as illustrated in Fig. 2, for the first revolution shoe *M* will recede from center *O*. The resulting angular motion of lever *L* around its fulcrum will be transmitted through the ratchet device to planetary *S* and from it to gear wheel *C*. Therefore, during this half-revolution the gear *C* has run ahead of its normal angular motion, which latter is the same as that given to axis *P*. During the next half-revolution the shoe *M* approaches to center *O* and the angle diminishes, but this has no effect on the gears, as the ratchet does not engage. If the masses in motion have sufficient inertia, the gear wheel *C* may retain its speed until the following half revolution, when it gets another impulse. This arrangement therefore permits of increasing the speed of the gear *C* with relation to that of the selector axis *P*.

The Ratchet Device

A number of selectors may be arranged around the circumference of the gear wheel *C*, thus reducing the length of time during which the mechanism has to be carried ahead by inertia effects. The axes or pivots of these selectors are secured to the same disk, and it is this disk to which the motion is imparted.

The ratchet device used in the L.C.B. transmission is of the type illustrated in Fig. 3 and a sectional assembly view of the whole transmission is shown in Fig. 4. Shaft *M* is connected to the engine shaft and carries keyed to it two pinions *a* and *b*. The former meshes with the planetary pinions *i* carried on a disk *L*. This disk, which is arranged to turn freely on shaft *M*, may also be locked by the brake *f*. Other planetary pinions *J* are rigidly secured to the planetaries *i*, both being keyed to the same shaft. These latter planetaries *J* mesh with a pinion formed integral with the disk P of the selector *S*.

The levers of the selectors are shown at *t*, and *k* represents the shoe which slides in the eccentric groove. *C* is the sun wheel on which the selectors act. This

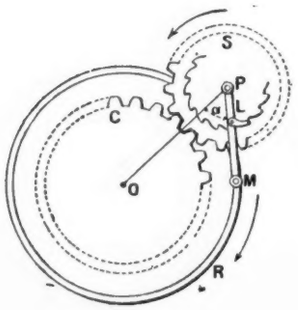


Fig. 1. Diagram of sun and planet wheels and ratchet device

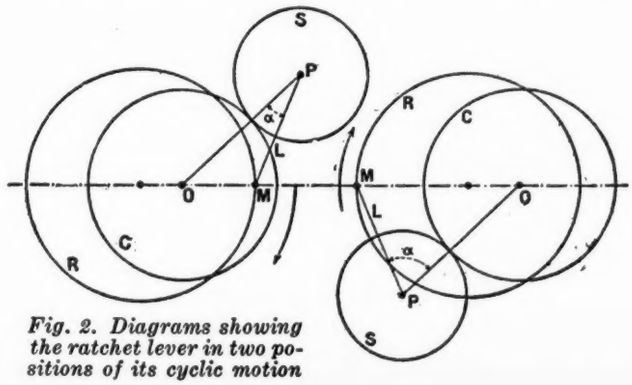


Fig. 2. Diagrams showing the ratchet lever in two positions of its cyclic motion

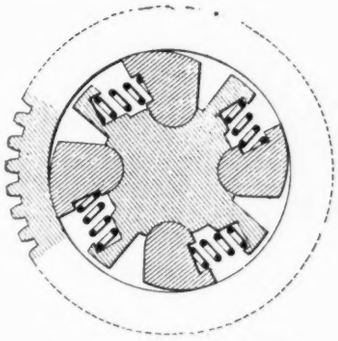


Fig. 3. Friction ratchet forming part of the transmission

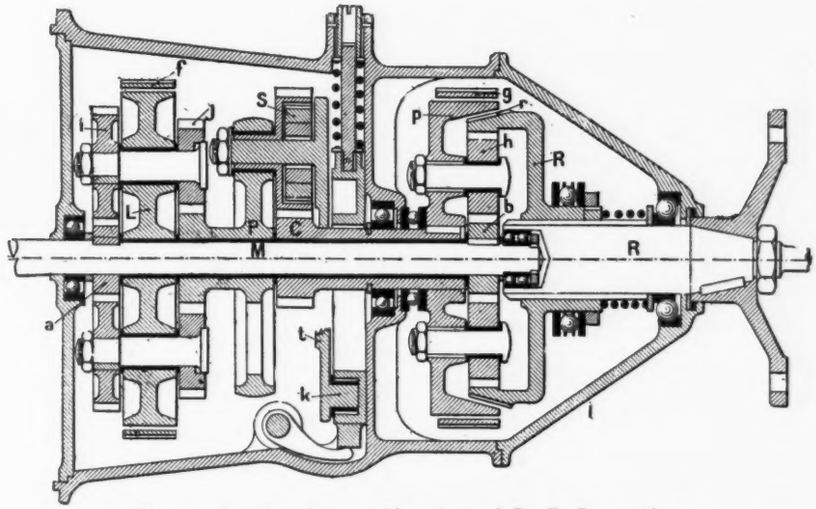


Fig. 4. Sectional assembly view of L. C. B. continuously variable transmission

sun wheel has rigidly secured to it the disk *p*, on which are carried a number of planetaries *h* which mesh on the one hand with the second pinion *b* on the driveshaft *M* and on the other with the internal gear on the driven shaft *R*. The disk *p* may be held stationary by a brake *g*. It also forms a female cone with which the male cone on the driven shaft *R* may be engaged.

For free running it is necessary that driven shaft *R* remain stationary while driving shaft *M* is rotating. This necessitates that brake *g* be released and that the selectors *S* do not act on gear *C*, which is the case when brake *f* is disengaged.

Therefore, in order to "declutch," all that is necessary is to loosen brakes *g* and *f*.

To start the car the brake *f* is applied gradually. The disk *L* then comes to a stop gradually, the planetaries can no longer turn around shaft M, and therefore cause the gradual speeding up of plate *P*. If the eccentricity of the groove is nil, the disk *p* and the gear *C* are locked together by the selectors. The female cone at the right then no longer turns freely at the speed for which the driven shaft *R* remains stationary, and the latter is therefore carried along at a speed which depends entirely on the pitch circle diameters of pinions *a*, *i*, *J*, *M*, *b* and *h*. The car is now operating in first gear, as it were.

Increasing Speed of Shaft

Up to this time the sliding groove has remained concentric with shaft *M*. It was shown previously that the greater the eccentricity of the groove the higher the speed of gear *C* will be in relation to that of plate *P*. It is thus obvious that by increasing the eccentricity of the groove the speed of the driven shaft *R* can be increased. It will be noticed from the sectional view that the ring containing the circular groove is held in position by a spring on the one hand and by pressure on a lever at the bottom of the case on the other, this lever being connected by a linkage to a lever on the steering wheel. The force which must be exerted on the lever at the bottom of the case to hold the eccentric ring in position is proportional to the torque being transmitted, and it is therefore possible to make the transmission automatic. The reactions of the drive tend to force the eccentric ring into a position of smaller eccentricity; in other words, into a position corresponding to a larger reduction ratio, and it is only necessary to oppose this displacement by a spring of suitable characteristics to have an automatically variable gear.

For direct drive the brake *f* is released, which frees the members of the progressive gear change, and then the conical clutch at the right is engaged, which causes the whole transmission to revolve as a unit. To change back from direct drive to the continuously variable drive requires the reverse operation.

For the reverse, the female cone is gradually brought to a stop by the application of brake *g*. The spindles of the planetaries are then stationary in space and the driven shaft *R* turns in the reverse direction. Reversing is effected by pressing down on a pedal. Brake *f* is released when reversing. By applying brake *g* while the gear is set for forward motion a powerful braking effect is obtained on the car.

The control members comprise this reverse pedal, a lever for changing the position of the eccentric ring to vary the ratio, and a clutch operating device.

Spring-Testing Machine

IN order to duplicate in the laboratory the stresses to which chassis springs are subjected in service, the Detroit Steel Products Co. has constructed a vibratory machine which, in addition to subjecting the spring to all the stresses that occur in actual service, keeps a graphic record of its performance up to the time it breaks. The machine then stops automatically.

The spring is set in motion by a mechanism, the impulses of which are subject to adjustment, and it is then allowed to vibrate naturally until interleaf friction has absorbed the energy imparted. The operation is repeated once about every three seconds, until the spring fractures. The number of shocks which the spring withstands before it fails is recorded by a counter, and the number and violence of the vibrations following are recorded graphically. These records are used as a basis for spring design. With the same machine the effect of Hexdees in prolonging the life of chassis springs is studied.

AN international aircraft exhibition is to be held in Berlin in the spring of 1928, the organizing bodies being the Berlin Municipality, the Office of Exhibitions, and the German Association of Aircraft Manufacturers. Invitations to prospective exhibitors are to be issued shortly.

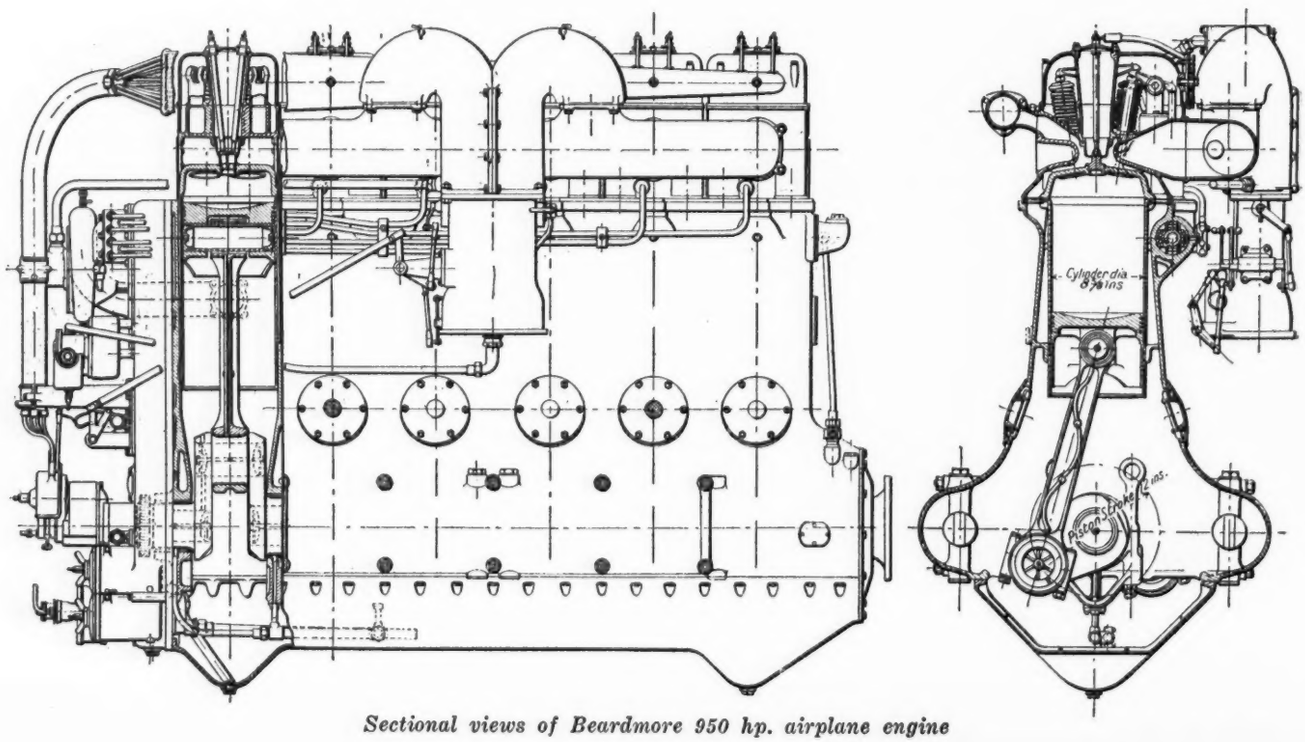
Beardmore Six-Cylinder Airplane Engine Develops 950 Hp.

One of largest aircraft powerplants ever built. Vertical cylinders have 8⅝ in. bore and 12 in. stroke with a compression ratio of 5.25 to 1. Dry engine weight 2150 lb.

ONE of the largest aircraft engines ever built is the Beardmore "Cyclone," which with only six vertical cylinders develops 950 hp. at about 1350 r.p.m. Since the engine development work of the Beardmore company is carried on for the most part for the British Government, it has been impossible until recently to get any details of these engines. A short time ago, however, a Cyclone engine was built for the Ernst Heinkel Flugzeugwerke of Warnemunde, Germany, and was tested for the purchasers by Lieut.-Col. W. A. Bristow. Details of this test and of the general constructional features of the engine were published in *The Engineer,* from which the following particulars and drawings of the engine are reproduced:

The engine has six cylinders, each 8⅝ in. in diameter, with a piston stroke of 12 in. and a designed compression ratio of 5.25 to 1. The overall length of the unit is 80.3 in. with a maximum width of 35 in., while the overall height is 60.37 in., with a total height above the center line of the crankshaft of 45.25 in., and a maximum depth to the lowest point below the crankshaft center of 15.12 in. The dry engine weight, which includes all necessary accessories, but no oil and water, nor the propeller hub, is 2150 lb. The engine is water-cooled and a circulating pump is fitted. The ignition system is in duplicate, and two Watford magnetos are employed. As illustrated, the engine is designed for a left-hand tractor-type propeller running at a normal speed of from 1220 to 1350 r.p.m. according to the power it is desired to develop.

In getting out the new design the object in view was to develop as high a power as possible in a few cylinders. It was also sought to reduce the number of engine parts while retaining the maximum accessibility. An outstanding feature of the engine is its compact and clean outline, which enables it to be installed in a very narrow fuselage, thereby reducing considerably the amount of head resistance which would be offered by an engine either of the radial or the V type. The crankcase, which is made in aluminum, forms the main engine body. It incloses the crankshaft and its bearings, which are carried on transverse girders, while the camshaft is accommodated in the top part of the casing. At the level of the crankshaft, the body is swelled out to give great



Sectional views of Beardmore 950 hp. airplane engine

lateral strength to the crankcase about the crankshaft, and permit of direct connection to the engine bearers, while underneath there is a removable oil sump. Access to the working parts is given by inspection doors, which are fitted to each cylinder, one on either side of the crankcase. Cylinder liners of thin steel are inserted into the upper part of the casing, and are supported both at the top face and by a lower ring, which incloses the cooling water space.

It will be seen that the cylinder head and valve gear form a separate unit, which is readily detachable. For each cylinder there are two exhaust and two induction valves which are operated through rocker levers by short push-rods. As shown in the left-hand cylinder section, twin spark plugs are fitted in the crown of the cylinder head and are well cooled. The same illustration shows the end gearcase inclosing the gear drive from the crankshaft. The camshaft, it will be seen, is driven by a series of intermediate gears, which in turn are usefully employed to drive various accessories mounted on the end case. This casing, with its attachments, is so designed that it can be removed from the engine in a few minutes while each accessory can, when required, be quickly detached. The various auxiliary fittings referred to, include, besides the two magnetos, the lubricating oil pressure and suction pumps, the circulating water and fuel pumps, as well as a gas distributor, and gun gear, when the engine is designed for use in a military machine. At the bottom of the gearcase there are duplex lubricating oil filters on both the pressure and suction sides of the oil system. The filters are provided with change-over valves, so that either can be cleaned while the engine is running.

Lubricating System

Brief reference may be made to the lubricating system. Oil is delivered under pressure to the main bearings, and passes by means of drilled passages to the big ends, after which it is taken up to the piston pins through tubular connections, which are strapped to the webs of the steel connecting-rods. A hollow piston pin, with closed ends, is used. The piston is made of forged and machined aluminum, and is fitted with three piston rings and one scraper ring. All of the wheels have ground teeth, and ample lubrication is provided by the oil, which returns from the pressure-fed camshaft bearings.

The engine described was fitted with a 97 mm. Zenith twin carburetor, which works together with an induction system, that has been evolved as the result of considerable experimental work. The test results given below apply to the engine fitted with this carburetor, but a superior performance which approximates more closely to the standard type of engine is given when a 120 mm. carburetor is fitted.

Three test runs were made at different speeds, the results of which are given in the above table. These illustrate the fuel economy of this type of engine, especially when it is running at a cruising rating. In order to determine the amount of lubricating oil used, the total oil required was logged over the running period of 6 hrs. and 10 min. During this time, 52.75 lb. of oil were utilized, which is equal to a consumption of .01 lb. of oil per brake horsepower hour. The lubricating oil corresponded to the Air Ministry specifications P4, and had a specific gravity of 0.895, at a temperature of 60 deg. Fahr. A fuel mixture of 80 per cent Shell aviation spirit and 20 per cent benzol was used for the test. It had a specific gravity of 0.760 at 60 deg. Fahr. The average temperature outside the test house during the trial was 38 deg. Fahr. while that at the engine carburetor was about 56 deg. Fahr., with a 30-in. barometer. In order to supply the load a specially designed Froude water brake was used. The engine was started with ease by means of a Bristol gas starter.

Test Results

Speed, load and power			Fuel consumption	
R.P.M.	Pounds loads	B.H.P.	Average fuel used per hr., gal.	Pounds per B.H.P. hour.
1220	710	722	44.22	0.465
1220	795	808	51	0.48
1350	843	949	63.75	0.512

Official Test of Twin City Tractor

REPORT of official test No. 127 has been issued by the University of Nebraska Agricultural Engineering Department, the tests having been made on a Twin City Model FT, 21-32 hp. tractor manufactured by the Minneapolis Steel & Machinery Co., Minneapolis, Minn. The engine was equipped with a Zenith U-6 carburetor and an American Bosch ZR4 Ed. 26 magneto. The wheels were fitted with 48 spade lugs each, 3½ in. high by 2½ by 3 in., the extension rims being 6 in. wide.

In the "rated load test" the engine developed 32.34 hp. at 1004 r.p.m. during a period of two hours. The fuel used was kerosene and the average consumption was at the rate of 1 gal. per 9.64 hp.-hr. The atmospheric temperature being 74 deg., the temperature of the water leaving the engine jacket was 181 deg.

In the varying load test the engine was run at various loads for 10 min. each, and finally at 19.83 hp. at 1042 r.p.m. for 6 min., the fuel consumption during this latter run being at the rate of 1 gal. per 7.57 hp.-hr. In the maximum load test the engine developed 35.875 hp. at 999 r.p.m. for one hour, consuming kerosene at the rate of 1 gal. per 8.31 hp.-hr., while in the half load test, which also lasted one hour, the engine developed 16.62 hp. at 1029 r.p.m. and consumed kerosene at the rate of 1 gal. per 6.81 hp.-hr. No water was injected with the fuel in any of these tests. The kerosene used weighed 6.77 lb. per gallon.

In the ten-hour rated load test the engine developed 22.30 hp. at 999 r.p.m. and the drawbar pull was 2661 lb. at a speed of 3.14 m.p.h., with a slip of the drive wheels of 2.89 per cent. The fuel consumption was at the rate of 1 gal. per 6.51 hp.-hr. In the maximum drawbar load test a drawbar pull of 3531 lb. was developed at 2.945 m.p.h. with a wheel slippage of 8.88 per cent and a drawbar pull of 5092.5 lb. at 2.28 m.p.h., with a wheel slippage of 5.93 per cent. In the former case the engine developed 27.75 hp. at 992 r.p.m. and in the second, of 31.05 hp. at 997 r.p.m. The rated load and first maximum load tests were run in high gear, while the second maximum load test was made in low gear. The distance advanced by the tractor without load on level ground for one complete revolution of the drive wheels was taken as a basis for calculating wheel slippage. The power required for the rated load test was 21 hp. but the driver had the load slightly heavier than intended.

During the complete test, covering about 36 hours' running, the following oil was used: For the engine, 3¼ gal. of Mobiloil A, 2½ gal. being required to fill the crankcase and three quarts having been added. None was used for the transmission.

Rail Cars Call *for* Engines of Sturdy *and* Compact Design

Must not take up too much floor space and must be able to operate for long periods between overhauls. Subject discussed at meeting of Pennsylvania S. A. E.

THERE is already a rather large number of automotive type internal combustion engines in use in rail service in this country and the possibilities for further development in this field are good. Between 450 and 500 gasoline engine driven rail cars are now in operation; there is a possible demand for 3500 to 5000 of them in the future.

At the meeting of the Pennsylvania Section of the Society of Automotive Engineers held in Philadelphia March 8, this subject was discussed by A. H. Candee, Westinghouse Electric & Manufacturing Co. Although the engines employed in gasoline rail cars are, in general, similar in design and construction to those employed in automotive work, the particular service for which they are intended brings about a number of important changes in automotive practice.

Some of these items were suggested by C. O. Guernsey, J. G. Brill Co., in his discussion of Mr. Candee's paper. The ratio of power to weight in rail car practice reaches limits of 800 to 1000 lb. per hp., as compared with 50 to 60 lb. per hp. in usual automotive practice. The rolling resistance of rail cars, since they move along hard, smooth tracks, is considerably smaller at all speeds than that which applies to road vehicles.

Long life, not only ultimate life, but periods between overhaulings, must, in general, be considerably greater for rail car engines than for those used in automobiles. The rail car engines are in much more constant use than are automotive engines and railroad operators desire to take the cars out of service for overhauling just as infrequently as is possible.

Fuel Consumption Heavy

Fuel consumption in rail cars is a very heavy item, an average figure being about 120 ton-miles per gallon of fuel although under very good operating conditions as high as 250 ton-miles per gallon have been obtained. Because the market for rail car engines is limited so that the economies of mass production cannot be resorted to, the cost per horsepower is considerably higher than in automotive engines of similar design. An average cost for rail car engines, Mr. Guernsey said, is about $20 per horsepower. This applies to constantly available horsepower and not to peak output available only under test conditions.

The difficulties of designing an engine to produce the proper amount of power but without taking up too much space are considerable, but this is made necessary because of the great cost of space in a rail car. An average rail car frame and body costs about $500 per lineal foot so that it is evident that a very closely coupled powerplant is necessary in order to reduce the rental value of the space it occupies.

An average figure for the relation of weight of a rail car engine to power output is about 15 lb. per hp., this again referring to actual horsepower rather than to theoretical peak output.

Transmission of Energy

Mr. Candee's paper contained a brief history of rail car development followed by information concerning current practice in design with particular reference to methods employed for transmitting the energy developed by the engine to the driving wheels of the car. According to him, the gas-electric type of transmission, similar to that being used in bus service, is proving very satisfactory at the present, particularly for plants of relatively high power.

Mr. Candee's paper follows in part:

While steam train costs on branch lines vary from $0.75 to $1.50 per train mile, with an average of from $0.90 to $1.00, we find we can handle the same service by gasoline engines at a train mile cost varying between $0.30 to $0.60 with an average approximating $0.36 to $0.40, including fixed charges. Oil engine driven trains will operate between $0.25 and $0.50 per train mile with an average of $0.33 to $0.35 also including fixed charges. In addition there are a number of indirect returns which are exceedingly difficult to evacuate, such as reduced right of way maintenance, reduction of attendant facilities and charges, and improved public relations.

The thermal efficiency of the steam locomotive is admittedly low, averaging not over 6 per cent at the rail. The thermal efficiency of the gasoline engine powerplant is considerably better than that of a steam locomotive, for we can get as high as 20 per cent of the energy of the fuel at the rail. The oil engine powerplant as applied to rail propulsion will operate at an overall thermal efficiency as high as 25 per cent.

It is not generally feasible to apply existing standard engines to rail propulsion service. Engines used in automotive work are generally small and lack the necessary stamina. If an engine is found to possess the latter feature it is usually because it has been built for stationary work and is too heavy and large for transportation purposes. It seems necessary, therefore, to design engines for this particular field of application. The speeds must be high to reduce cost and weight and yet reliability and long life are of paramount importance. If you will consider that a

year of rail car service is equivalent to 10 years' service for your automobile engine you may get a conception of the duty imposed in this field.

For stationary and marine purposes oil engine weights run from 60 lb. per hp. up, whereas for rail vehicle use they must weigh less than 45 lb. and preferably not over 20 lb. per hp. Slow speeds are not tolerable because slow speeds mean increased weight in both engine and generator, resulting in further addition of weight and strength of car bodies or locomotive construction, thus pyramiding both cost and weight of the vehicle as a whole.

The preferred form of the locomotive oil engine has not yet been defined, for while the present tendencies are toward the use of four-cycle engines on account of the available knowledge and experience there are a number of very promising developments being undertaken in the two-cycle field. Solid fuel injection is preferred to the air injection.

The transmission of energy from the engine to the wheels forms a broad subject in itself. In rail cars, when engine sizes were small and a single rear axle was used, the ordinary gear shift form of automotive transmission was sufficient and satisfactory. When weights increased to a point where it became necessary to drive through a four-wheel swivel truck the mechanical drive became serious. The Brill company accomplished this very satisfactorily by transmitting power to a set of gears in the truck bolster, driving the wheels from there, so that swiveling of the truck did not seriously affect the drive. In other cars engines were mounted directly on the truck in order to obviate the drive difficulties, in one case the gear shifting and clutch operations being controlled electro-pneumatically.

Magnetic Clutches

A mechanical transmission of large size is in use on the Lomonosoff locomotive in Russia. This utilizes magnetic clutches with the gears constantly in mesh. Hydraulic transmission has been tried several times with some degree of success, but at this time does not appear to have a very large field of application in rail service.

The electrical form of transmission embodies qualities which render it the most practical for railway propulsion, especially for engine sizes above 125 hp. Below this power there are satisfactory mechanical transmissions and the advantages of the electrical form are discarded for the sake of cheap construction. The essential advantages which make the electrical transmission the most desirable are the smooth flow of power to the wheels regardless of tractive effort or speed, the flexibility of control and application of power, and the absence of rigid or troublesome mechanical connections between the spring mounted engine and the wheels.

The present limitations in the application of engine driven vehicles to rail service are imposed by the size of engine which may be applied to the vehicle. We would like to apply engines of two or three times the horsepower capacity now used, but this is not economically possible on account of weight and cost. It is therefore essential that the utmost use be made of the engine which may be applied. The electrical transmission permits such utilization over a very wide range.

To the mechanical man the electrical transmission may seem complicated and mysterious, but as a matter of fact it is simple. The engine is directly coupled to a simple generator which furnishes power to propulsion motors geared to the axles. An auxiliary generator also driven by the engine furnishes power for exciting the field of the main generator and also for charging a small storage battery used for engine starting and car lighting. The control of power is also simple. With gasoline engines this is usually accomplished simply by varying the engine speed, automatic adjustment of the current and voltage being built into the apparatus. With the oil engine, which does not have as wide a range of speed control, it is sometimes necessary to make a few generator field adjustments before raising the engine speed, but this involves very little complication and occurs automatically with movement of the throttle control lever.

Striving for Simplicity

There are, of course, numerous variations of these schemes of control and they merely demonstrate the extreme flexibility of the system. It may be stated, however, that electrical designers realize the importance to the railroads of electrical simplicity and are bending their efforts toward that end.

In the electrical system of power transmission as in any other system, the problem of the auxiliaries is troublesome. Pressure air for the brakes must be provided and also cooling air for the radiators. Batteries must be charged and in some cases heat and light provided for trailing cars. It is these auxiliaries which cause a large part of the apparent complication in the self-propelled vehicle and yet these auxiliaries must be provided for, whatever the system of transmission employed.

In the application of engined cars or locomotives to rail service we first face the fact that we are dealing with limited power. We find that rail cars of 250 hp. are called upon to handle services formerly handled by steam locomotives of 800 to 1000 hp. capacity and they can often do it surprisingly well. It is also found that in a great many cases the railroads call for cars which can reach a balancing speed considerably in excess of that required to handle any normal branch line service. The psychological effect of being able to attain a 60 m.p.h. speed is wonderful but it imposes restrictions on the trailer capacity.

Automobile Retail Outlets

IN the 1927 Statistical Issue of *Automotive Industries*, published on Feb. 19, appeared a tabulation showing the number of car sales per dealer in five competitive price classes. To permit a breakdown of this kind it was necessary, of course, to count the number of dealerships rather than the actual number of individuals selling cars at retail; if a single man, for example, handled two makes of cars, he was counted twice in making up the tabulation.

Thus the total number of dealerships came to 69,600, a figure naturally somewhat in excess of the total number of separate retail outlets. This explanation is printed because of some slight misunderstanding which seems to have arisen over the difference between the two totals.

Another Side of the Question of Bus Sales Policies

Transportation expert thinks bus manufacturers have acted wisely in fostering close business relations with railway interests. Utilities are most desirable customers, he says.

By G. Lloyd Wilson
Assistant Professor of Commerce and Transportation, University of Pennsylvania.

AN extremely practical question about bus marketing has been raised recently by some motor vehicle manufacturing interests and by *Automotive Industries*. Briefly stated, the question runs something like this: Have bus manufacturers lost many sales by pursuing too fully a policy of conciliation with rail interests, by assuming a passive attitude in selling buses and by waiting for the railways to determine where and how motor vehicles can be used to improve transportation, instead of adopting a more aggressive policy of opposing rail interests in certain instances and pushing the bus more vigorously as an instrumentality of mass transportation?

If it be conceded without argument that up to the present time the sales of buses to electric railways and steam railroads have been but a small percentage of the total sales, does it follow that the bus manufacturers have erred in not aggressively championing the bus as the coming instrumentality of mass transportation and in striving too earnestly to placate the railways? We beg to submit that they have not.

THIS article is written by a man who has been a close student of transportation for a number of years, who has done and is doing actual consulting work in the fields of motor, rail and steamship transport and who is able to view the question of motor and rail transport coordination from a practical and yet relatively unbiased viewpoint.

His views on some phases of this important question are not those of *Automotive Industries*, but are presented as a thoroughly constructive contribution to the current discussion of bus marketing policies.

The bus manufacturers have invested billions of dollars in plants, equipment, patents and in developing good will. They have found through experience, costly in many cases, that competition of the cut-throat variety does not purge the industry of the weak and inefficient without draining the resources of the stronger organizations. Cooperation and directed competition both in service and price are rapidly replacing the old order. This is in the best interests of the manufacturers, distributors, dealers and buyers of automotive equipment.

Competition of manufacturers and distributing agencies has often resulted in the placing of buses and trucks in weak hands. This experience has been costly to the manufacturers and distributors as well as to the buyers who rushed into the transportation business without experience or financial backing in many cases.

The ideal situation for the manufacturer of automotive equipment is to place the vehicles in the hands of strong buyers who can operate the equipment successfully and who are supplied with an adequate supply of capital. Such buyers are becoming available in increased numbers as electric railways, steam railroads and strong independent operators replace the small operating companies as buyers. Fewer buyers, more trucks and buses per buyer and fewer vehicles thrown back on the sellers' hands per vehicle sold, better financing and surer payments may well be the goals of the equipment manufacturers.

These ends are much more apt to come and come soon if the vehicles are placed where they can be effectively used than if they are placed promiscuously to be used in conjunction with and in competition with other agencies. Trial by battle through head-on collision of interests between the manufacturers and operators of automotive equipment and the manufacturers of railway supplies and operators of rail lines is heroic, perhaps, but experience has show that competition of this type has led to many gory battles. Railroads, electric railways and steamship lines have tried it in the past.

Rate wars, cut-throat competition of price and service, preferred treatment of shippers to obtain and retain fugitive users of the services led to bankruptcy of many of the competitors. It was not unusual for two competitors to reduce each other to financial ruin without either being able to drive the other from the field. The Interstate Commerce Commission and the state public utility and public service commissions have been created to referee the competition of carriers and to prevent such wanton wastes, which do not benefit the manufacturers, operators or the public.

The transportation business is a quasi-public enterprise, an activity clothed with a public interest, which

places it apart from purely private commercial activities. The carriers to be used in the future will be selected by the public not as a result of ruthless competition but as a result of discriminating selection. One of the gravest mistakes in transportation thought in the past 10 years is the assumption that some one particular instrumentality of transportation is the "backbone" of the transportation system and that other agencies are destined to assume positions of relative unimportance.

Early commentators upon the railroads predicted that the iron horse and the railed highway would entirely eliminate the canal, inland waterway, coastwise steamship transportation and the highways from the transportation system. One hundred years after the introduction of railroad transportation all of these forms of transportation flourish side by side and the motor and the airship are added to the list of useful transportation facilities. There is room and need for all forms in a country where traffic is measured in billions of ton miles and billions of passenger miles per year and where the volume of freight and passenger traffic is increasing with relentless regularity year by year.

An equally improper assumption has been that the coordination of motor freight and passenger transportation with other facilities means the relegation of the motor to a place of minor importance to be used in areas of light traffic, as feeder or auxiliary facilities to be used where, as and if the rail carriers choose.

Coordination may be accomplished through the ownership and operation of motor trucks and buses directly by steam or electric railways or by steamship companies; by motor transportation subsidiaries of these companies; or by the combining of independent motor lines with railroads, electric railways and steamship lines by means of interchange facilities, through routes, joint rates and fares and adjusted schedules. The ideal in coordination is the substitution of the more efficient for the less efficient agency of transportation in any particular service and the joining of all agencies in an organized service in the public interest. *These arrangements can be made as well if the agencies are independent as if the agencies are subordinated to one another.* The object of coordinated transportation is to assure orderly working arrangements and to guard against ruthless and wasteful competition.

Take Issue With Railroads

Some bus manufacturers and independent truck and bus operators take issue with the assumption on the part of certain railroad executives that the transportation of the public rightfully belongs to the steam railroads and electric railways and that all competing motor services are to be forbidden by the state commissions until the railways decide to employ motor vehicles. The motor interests object to this policy of permitting the sphere of usefulness of the motor vehicle to be determined by the rail managements, a number of whom have introduced motor vehicles into their systems only with the "greatest reluctance."

The policies of the state public service commissions, the courts and the statutes of a number of states have been to allow the free development of rival transportation systems where they do not directly impinge upon one another, but to protect the large investments of existing carriers if their services are or can be made to be adequate and if the services are of benefit to the general public. The Public Service Commission of Pennsylvania in 1924 stated its position in the matter of protecting the interests of existing carriers and of the general public. This decision is a case in point:

"It has been the policy of this Commission to refuse to permit competition with existing utilities which have large investments and are necessary for the public convenience, if their service is or can be made reasonably adequate. No transportation agency can render perfect service at all times to all persons. The Commission must consider the benefit to the general public. The use of motor trucks for transporting property has reduced considerably the receipts of railroad and electric railway companies. Although such motor service may be more convenient to some shippers than service by electric railway or railroad, consideration of public convenience will not permit the Commission to take action which will endanger the continued financial stability of such established roads." (1)

Service Must be Satisfactory

It must not be implied from the attitude of the commissions, legislatures and courts in seeking to protect the investments of existing transportation facilities that carriers by rail have the exclusive power to serve the public by some theory of "divine right." The decision of the Pennsylvania Public Service Commission, quoted above, contains these highly significant words, *"if their service is or can be made reasonably adequate."* Standards in transportation, like standards of living, are progressive. What was reasonably adequate transportation 100 years ago is miserably inadequate today.

The railroads and electric railways are not guaranteed immunity from competition by the trend in court and commission decisions if they fail to make their services adequate. If the establishment of adequate service requires the use of motor transportation as well as rail, then the former must be offered the public through vehicles of the railroads or railways, of their facilities or of independent motor operators through a coordinated service. Certainly the railroad and electric railways cannot expect, and the public most certainly will not endure, standards of transportation service that are inadequate in any particular district to continue merely to protect the investment in railway property.

The investors in steam railroad and electric railway securities cannot expect to enjoy a reasonable return upon their investments if they fail to provide reasonably adequate facilities to meet the transportation requirements of modern business and travel. The most that can be expected is an opportunity to provide the types and kinds of service required in the public interest. If motor service is required to make services adequate, motor facilities must be added to rail facilities directly, through subsidiary operations or by joining with motor utilities in through service, interchange, rate and fare arrangements.

The questions naturally rise, How are the rail interests, motor operators and automotive manufacturers to measure reasonable adequacy in service? and, How may the transportation agencies best suited for service be found without a period of free-for-all competition and chaos? There is no way of determining the precise limits of the sphere of any transportation utility.

The answer lies in painstaking comparative research, experiments, cost comparisons under actual conditions and in selecting the more efficient to replace the less efficient in each given case. Certain general principles of motor and rail operation are known. These principles must be applied to specific problems and the results used as the bases for further experiments.

Finally, adequacy of service is ultimately determined by the public. The traveling and shipping public knows what it requires and is not hesitant in asking for it.

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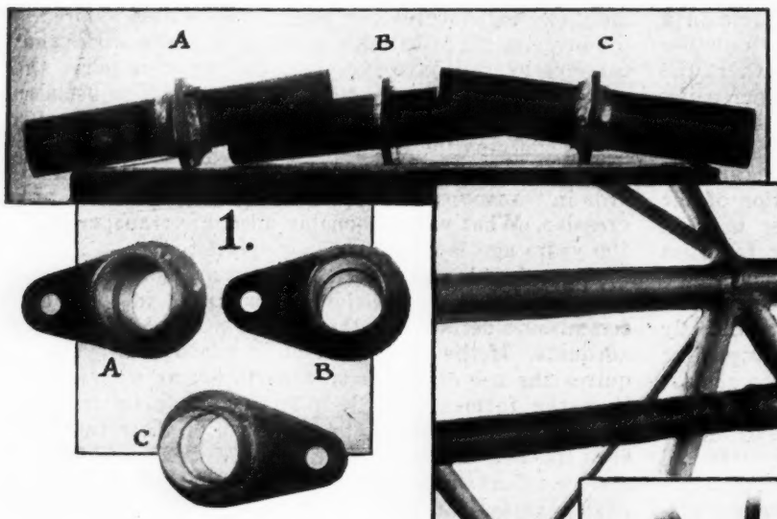
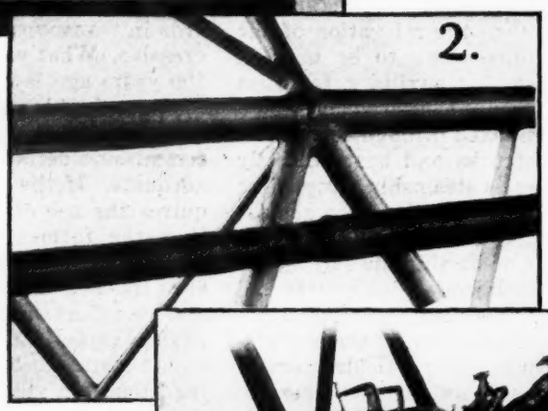
(1) In re Bingaman Motor Express Co., P. S. C. Pa., Docket A. 9092, Feb. 19, 1924.

Building a Steel-Tube Fuselage —the Pitcairn "Orowing"

Pictures show production methods used in turning out modern commercial plane which can be sold at $2000.

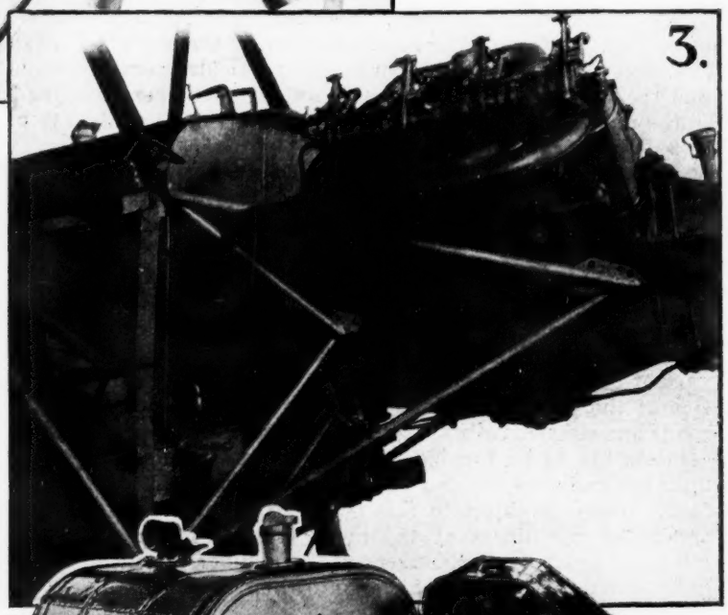


1—One of the basic features of Pitcairn steel-tube fuselage construction is the method by which a sleeve is used in welding thick plates to tubes. Three experimental welds of different types are shown. The one at the right shows the minimum of burning of the longeron. The sleeve is first welded to the plate and then to the longeron



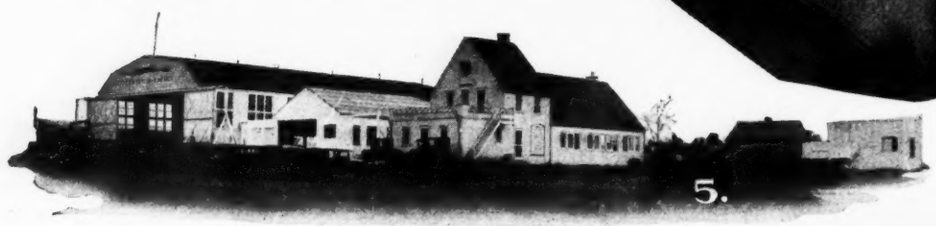
2—The use of butt-welded joints, which has been developed to a high degree by Fokker, is also followed in Pitcairn fuselage construction. Of course they can be used only where fuselage stanchions unite, as shown

3—Laminated wood engine bearers assist materially in reducing vibration. The powerplant installation is made as accessible as possible in order to provide ease of replacement. Note the gasoline strainer mounted on the dash. The glass inclosure often reveals causes of engine troubles

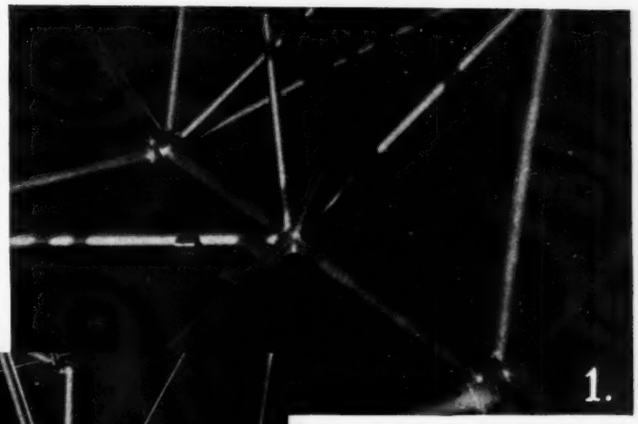


4—The gasoline tank in the Orowing is held in place by two steel straps with quick detachable fastenings. By disconnecting the outlet pipe the tank can be dropped without disturbing any part of the cowling. The baffle plate shown in the cross section view at the right also serves as a reinforcement for the tank

5—The Pitcairn factory has been completely remodeled during the past six months in order to enable more rapid production of standardized commercial planes of the Orowing type. It is adjacent to a good-sized flying field easily accessible from the center of Philadelphia. Note the engine test shed at the right

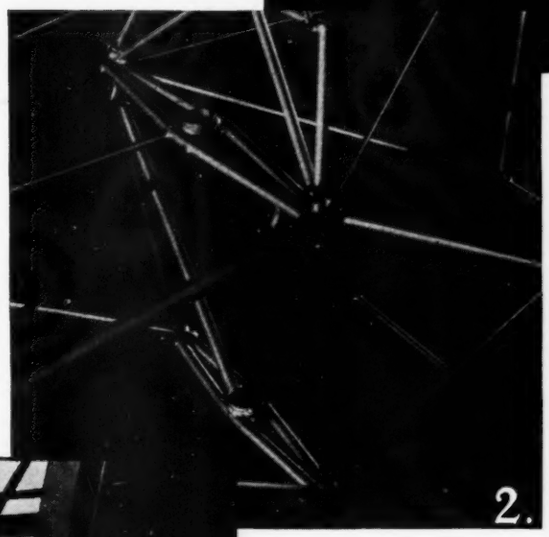


Airplane



1.

1—It has been found practical to simply butt-weld small diameter tubes for use as diagonals in the Pratt trussing of the fuselage. Where expansion has stretched the tubes, a reheating near the joint will induce contraction sufficient to re-establish the necessary tension

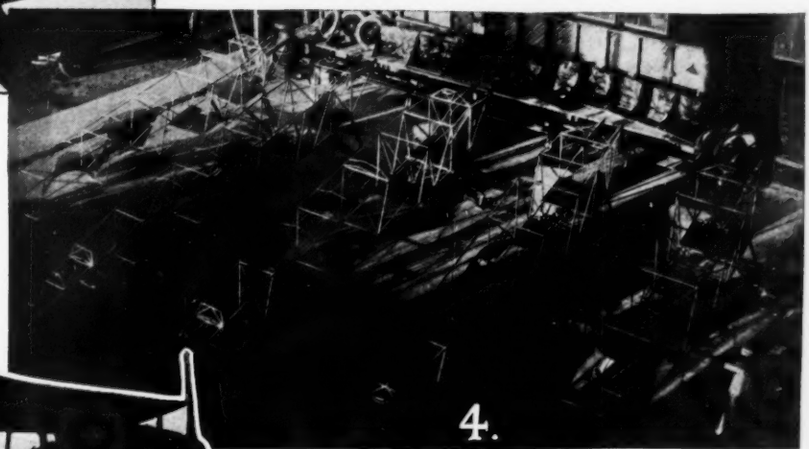


2.

2—Use of bronze bushings at bearing points is characteristic of Pitcairn fuselage structure. These are of the commercial quick-removable type. An example of this is that of the tail-skid post bearings shown here. The method of mounting these bearings is also very interesting

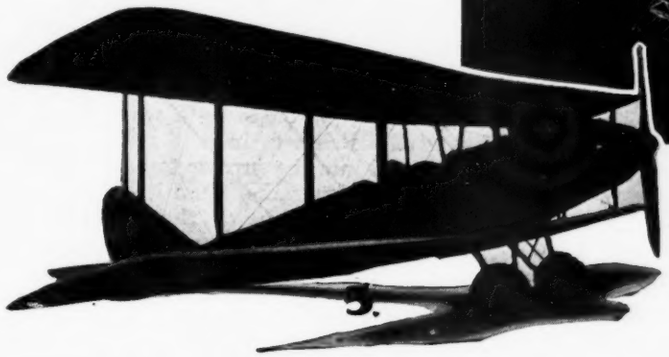
3.

3—Bronze swivel blocks are used for attaching the landing gear to the fuselage, allowing for weaving and twisting occurring through bad landing conditions. The landing gear itself is of the rigid axle type and is quickly replaceable



4.

4—Five Pitcairn Orowing fuselages in process of assembly. While the plant is not large, the efficiency with which space has been utilized in order to provide for the largest possible production is noteworthy. Wings, tail surfaces, etc., are stored on racks in back of the tails of the fuselages shown



5.

5—The finished product, the Orowing, is built to sell at $2000. It is very light on the controls and evidences inherent stability in horizontal flight. Wings are modified Curtiss Oriole type, while the fuselage is covered with fabric

Automotive Metallurgists Using More Complete Equipment

Up-to-date metallurgical laboratories employ microscope with photographic attachment, hardness, tensile and impact testing machines and spray-test apparatus.

AS in other departments of the automotive industry, considerable new equipment has been added to the metallurgical laboratory in recent years to increase the scope and efficiency of the metallurgist's work.

Some automotive metallurgical departments were started with one or two pieces of comparatively simple apparatus, the requirements of some plants still can be met without a full complement of "tools," but a recent trip through a number of important factories showed that the companies which are most active in metallurgical work usually make use of the following equipment:

1. A microscope with photographic attachment.
2. Devices for determining hardness of resistance to abrasion, including a Brinnell machine, Scleroscope, a Rockwell tester and a Spencer scratch hardness tester.
3. A tensile testing machine.
4. Notched bar or impact testing machine.
5. A spray-test apparatus for use on plated and rust-proofed surfaces.

Perhaps the most extensively used of these is the microscope with photographic attachment for securing permanent records of polished and etched surfaces of the material to be investigated.

To the engineer these photomicrographs usually have no more meaning than a page of notes in a stenographer's handbook, but the metallurgist, through his constant study of these pictures, is able to tell immediately whether a steel represented has a good grain structure, indicating good mechanical properties, or whether there is something abnormal in its characteristics. All steel is crystalline, and the size of the crystals, the relative regularity of their distribution and the widths and color of the bands separating them all tell their story.

The microscope reveals many different constituents in iron and steel, such as ferrite (pure iron), cementtite (an iron carbide), pearlite (a mixture of ferrite and cementtite in a definite proportion), austenite (a solid solution of carbon in iron), etc.

Examination Simplified

Some metallurgists simplify the microscopic examination of their polished and etched specimens and simply examine them under the microscope, while the majority make permanent records by means of photomicrographic apparatus. The former method is the simplest and quickest, as it does away with the handling of plates or films, their development, inscription and filing, but it does not afford the advantage of a permanent record of steels and other metallic materials of many different compositions and treatments, which are at all times available for comparison with the newest record made.

Preparation of the polished specimens for macrographic (natural size) examination involves considerable work, and in some of the laboratories doing work of this kind on a large scale, the specimens after use have their polished surfaces coated with collodion for protection against corrosion and mechanical injury, and stored. If it should be found desirable to examine them again the collodion can readily be washed off.

In taking photomicrographs, a magnification of 50 is usually employed on non-ferrous and 100 on ferrous metals. The photomicrographic apparatus, however, is so arranged that much larger magnifications can be obtained if desired. Since the photomicrograph usually obtained is of about 3 in. diameter, with a magnification of 100, the area actually represented is a circle of about 1/32 in. diameter.

Hardness Testing Devices

Next to the photomicrographic apparatus, the various devices used for determining hardness or resistance to abrasion are probably the most extensively used equipment of the average metallurgical laboratory. Hardness testing instruments or machines are also widely used in routine inspection work. Three different types are in general use and almost every laboratory is equipped with all of them. These are the Brinnell, the Scleroscope and the Rockwell tester.

With the Brinnell machine a hardened steel ball of standard diameter is forced into the surface of the test specimen or part under a standard pressure, and the diameter of the impression produced is then measured, this being an inverse measure of the hardness. Actually the hardness number is obtained from a table giving hardness numbers corresponding to different diameters of impression for standard size balls and standard pressures. With the Scleroscope a small drop hammer with a very hard point is allowed to fall from a certain height onto the surface to be tested and to rebound, and the height of the rebound, which can be either read off directly or recorded, is a measure of the hardness. The Rockwell hardness tester is based on a principle quite similar to that of the Brinnell, in that a steel ball or diamond cone is forced into the surface to be tested, but the depth of the impression rather than its diameter is measured. For this purpose one of the familiar dial gages is used, which is set to zero after the "penetrator" has been forced into firm contact with the test surface under a standard preliminary load. Then the normal test pressure is applied and the additional travel of the

penetrator is measured by means of the gage.

For hardness tests on cast iron the Brinnell machine seems to be more or less standard. Both the Scleroscope and the Rockwell machine are largely used for inspection work, an advantage of the former being that it does not destroy or injure the surface tested. For testing the hardness of case of case-hardened parts the rebound method represented by the Scleroscope also seems to have advantages over the penetrator method represented by the other two machines, as the penetrator is almost certain to break through the case and thus give a value correct neither for the core nor for the case. The Rockwell tester has come into wide use on account of its ease of manipulation. On materials of the same general character the results obtained with the different instruments mentioned are convertible with a fair degree of accuracy, but this is not the case if the materials differ widely in hardness. Evidently the "penetrator" type of tester must be used on a plane surface.

Spencer Scratch Tester

A further device for making hardness tests that is in use in metallurgical laboratories, is the Spencer scratch hardness tester, by means of which the hardness of individual crystals rather than that of crystal aggregates can be determined. A ruby of cubic form is pressed against the surface to be tested by a small standard weight, and the test surface is then moved perpendicular to the line of pressure, whereby a scratch is formed on the surface. This scratch is then examined under the microscope and its width is an inverse measure of the hardness of the material. The width of the scratch is always found to be less on the surface of a crystal than where it passes the boundary line between adjacent crystals.

While not used as much as the apparatus above referred to, a tensile testing machine is generally considered the most essential piece of equipment of a metallurgical laboratory. Such machines are found in practically all laboratories and are used to determine the tensile strength, yield point and elastic limit, these being still the fundamental tests for the strength of materials. In some cases, as a test specimen is being "pulled," stress-strain curves are being traced automatically by the machines, thus giving a permanent record of the test.

Another piece of apparatus used to a certain extent in the laboratories is the notched bar or impact testing machine, which measures the energy required to break a test bar of standard dimensions. There has been a good deal of difference of opinion in the past as to the value of this result, but there seems to be no doubt that sudden failure is less likely to occur if the material has a high impact value. Mr. Danse, metallurgist of the Cadillac company, employs the Fremont type of machine in a rather unusual way. Instead of breaking the test specimen by a single blow, he deals it a number of successive blows of gradually increasing energy. The energy of each blow is known and after the specimen has been broken the energies of the blows required to break it are added up and form a measure of its resistance to impact. All parts of the Cadillac car subjected to impact are submitted to this test. Two hammers are used, of 20 and 40 lb. weight respectively. In the first blow the hammer is allowed to drop from a height of, say, 1 ft. and the height of fall is increased by 1 in. for each successive blow, until the test specimen breaks. Holding fixtures for all parts of the car subjected to this test are kept in the laboratory.

In connection with tests on plated and rust-proofed surfaces wide use is made of a spray-test apparatus, consisting of a box of rectangular section in which the parts to be tested are suspended. The bottom of the box is covered by a salt solution and jets of air under light pressure are constantly blown into the box, usually at opposite ends and only slightly above the level of the salt solution. In this way the air picks up considerable salt and moisture, which are deposited on the test plates, and unless the protection is effective, rusting will soon set in. The length of time which the sample withstands the corrosive action of the salt spray is a measure of the rust-proofing quality.

Methods of Measuring Atomized Fuel Particles

A CONSIDERABLE amount of research work has been carried on in Germany in recent years to determine the average size of fuel particles sprayed under high pressure, as in Diesel engines. Owing to the short time available for the bringing together of the fuel and oxygen atoms and the combustion of the fuel it is absolutely necessary that the fuel be very finely divided mechanically, otherwise it will pass out of the cylinder unburned and thus cause waste. Of the half a dozen or more methods which have been evolved, some seem to be open to objections on the ground of lack of accuracy. The more recent methods, however, overcome these objections to a large extent and give results which must be very close to the truth, although actual cylinder conditions at the moment of injection are difficult to reproduce in every detail.

One method, which depends upon the increase in the total surface area with increasing fineness of atomization, and the consequent increase of the electrical capacity of the fuel particles, was described in a recent issue of *Automotive Industries*. By another method the fuel oil is sprayed into a bomb which is partly filled with a liquid which does not dissolve the fuel particles and in which they are held suspended unchanged for a certain period of time. The rest of the space in the bomb is pumped up to an air pressure equal to the compression pressure in the engine cylinder, so that the effect of air friction on the fineness of division is taken account of.

The emulsions of fuel oil and suspension liquid can then be studied in the microscope and the maximum and average diameters of the fuel particles produced with different injection pressures determined. Thus it has been found that with solid injection under a pressure of 3500 lb. p. sq. in. the average diameter of the particles is about 0.0005 in. Even finer division, however, is necessary to insure complete combustion in high-speed engines. Fortunately, further increase in injection pressures results in a rapid decrease in the size of the particles.

THE New Zealand general rate of duty on speedometers, rubber tires and tubes has been increased from 25 per cent to 35 per cent, ad valorem. The British preferential rate remains at 10 per cent, ad valorem, as formerly.

THE FORUM

Front Axle *Torque Member* Needed *With* Front-Wheel Brakes

Use would permit softer springing to be employed at front end of car. Subject beginning to receive attention abroad.

Editor, AUTOMOTIVE INDUSTRIES:

Your issue of Dec. 30, 1926, has a letter relating to the torsional strength of front axles; this letter, the article by P. M. Heldt in the Aug. 5 issue and the letter in that of Sept. 30, last year, raised some interesting points. Arising out of this discussion we are led into another, equally interesting, regarding the stresses set up in front springs by the operation of front-wheel brakes.

Leaving aside the vexing problems separating theory from practice in the manufacture of springs, it certainly would appear that further research is indicated in view of the serious alterations which have to be made to springs when front-wheel brakes are fitted to a car. It is well known that the necessary increase in the stiffness of the front spring to withstand the heavy stresses imposed by the braking torque is not obtained without some increase in the harshness of riding.

Everyone has been familiar for many years with what is known as the Hotchkiss drive of rear axles, in which the torque reaction from the bevel or worm gears, as well as that from the brakes, is taken through the rear springs.

It may be of interest to record that at the recent Olympia Show in London 49 per cent of the vehicles were fitted with a torque tube and 49 per cent with the open shaft, while among the latter were a number of vehicles fitted with a torque member, thus demonstrating that in considerably more than half the cars exhibited the Hotchkiss drive was not favored.

It is curious, therefore, that in the case of the front-axle, which is notoriously a more dangerous point than the rear at which to fracture a spring, the need for relieving the springs of the duty of resisting torque reaction seems to have escaped notice, and yet it would certainly appear that if a torque rod or its equivalent is desirable for the rear axle it is at least as important that one should be fitted to the front.

From conversations I have had with leading automobile engineers in this country it would appear that this question is at last receiving attention; it is an undeniable fact that, were a front axle torque member fitted, it would enable softer springing to be employed at the front end of the car, to the greater comfort of the passengers.

M. W. BOURDON,
British Correspondent,
Automotive Industries.

British Standardization Practice

Editor, AUTOMOTIVE INDUSTRIES:

In your issue of Jan. 8, page 27, you have an article on "Parts Standardization," comparing the S.A.E. system with ours (S.M.M.&T.) and citing two examples as issued by the British Engineering Standards Committee. These two standards were established by the Society of Motor Manufacturers and Traders and issued by the Institution of Automobile Engineers (I.A.E.), which is our regular practice.

There appears to be some misconception and I would suggest that the parts referred to come within the scope of the last four lines of your first paragraph.

Our scheme is to unify the parts of automobiles common to all makers. This obviates the fear of the makers that cars may ultimately become one pattern from radiator to number plate.

As quickly as possible after the publication of our Data Sheets we issue a list of firms who have undertaken to make and stock the parts standardized.

In such cases as battery crates, magnetos, dynamos, starting motors, and the like, we have standardized the outside dimensions only so that a motor owner, having trouble and being unable to replace the defective article with one of the same make, can fit any other make coming within the standard dimensions. No attempt has been made to standardize the working parts, which would stultify invention.

In the case of centers for artillery wheels at the first instance we reduced the number of sizes from hundreds down to 32, and at the last attempt, which was completed early in January, we further reduced the number to six. These are not paper standards—all the leading firms have agreed to them.

T. H. WOOLLEN, Standards Department,
The Society of Motor Manufacturers and Traders, Ltd.

Super-Expansion

Editor, AUTOMOTIVE INDUSTRIES:

I thank you for the prominence you gave my communication in your Dec. 30 issue and the fairness of your comments and criticism of my statements. Noth-

ing but good can come from such discussion and I hope it will be of value to your readers and the industry in particular.

While the efficiencies referred to were for full load conditions, in order to get a comparison with standard automobile engine efficiencies, it is, nevertheless, true that complete expansion engines varying the m. e. p. by the point of cutoff, do not develop a negative load below the atmospheric line as do standard throttling engines, therefore it is presumed that less m. e. p. is necessary to keep up the idling speed in the complete expansion type. Exhaustive tests of a complete expansion engine show a higher thermal efficiency at all ranges of load than a standard throttling engine.

My reference to the demonstration of Dr. Lardner, 1793-1859, author of books on integral and differential calculus, algebraical geometry and the steam engine, and professor of natural philosophy at London College, that a steamship could not carry sufficient coal to propel it across the Atlantic, was only to show that the best of engineers and mathematicians are not infallible. James Watt, the father of the modern steam engine called Trevethick, a co-laborer in the engineering field, a murderer because he wanted to carry 50 lb. pressure on a steam boiler, yet 1200 lb. today is perfectly safe.

But we may ignore the mistakes of the last century. The president of one of the largest Edison companies of the Middle West, when he was an electrical engineer in the Monadnock Building, Chicago, proved to me mathematically that underground street railway trolleys were commercially impossible on account of excessive current leakage, yet Washington, D. C., is not a city of miracles.

When Fred DeLand represented the *Electrical World* in Chicago in the early nineties, it published a photograph of a piece of water pipe taken from the Saginaw, Mich., water system, and the report of Ernest Speidel, the chemical engineer on the job, who attributed its deterioration to electrolysis. An editorial in the same issue referred to the report as emanating from the brain of a calamity howler, who was trying to knock the industry, and, as near as I can remember, wound up by saying that it was impossible for ground returns to inflict damage to water pipe.

"The stone that the builders rejected will become the head of the corner."

A Fuel Problem Solution

Increased commercial efficiency through all ranges of load by a more complete expansion of the working medium is, in my opinion, one of the solutions of the fuel problem.

The point I tried to make in comparing a four-cylinder with an eight of the same horsepower output, was that increasing the rubbing surface per unit of volume as is done in both an eight and a complete expansion engine, does not materially lower the mechanical efficiency. If it did, compound or triple expansion steam engines would show no increase in thermal efficiency.

If a cylinder full of combustible mixture in a standard engine is compressed, ignited and heated by chemical action, to 2500 deg. Fahr. and released before the piston has completed the working stroke, which is the same length as the compression stroke, there is no commercial expansion, as less volume was released than was compressed.

One of the losses of heat, that to the water jacket, of an internal combustion engine varies with the internal cylinder surface exposed to the hot gases. Therefore compound gas engines cannot commercially increase the horsepower output per unit of fuel. The cylinder wall condensation of steam makes the compounding of steam engines imperative. If steam were not condensable an earlier cutoff in a single cylinder would no doubt give as high an efficiency as is obtained by compounding.

Your suggestions why compound gas engines were probably abandoned is reasonable, when we consider that over 500 designs of automobiles and prime movers have fallen by the wayside.

Your last paragraph shows that you are open to conviction and I am sure that the time will come when *Automotive Industries* will be illustrating "more complete expansion engines," recording the thermal efficiencies obtained and wonder why such engines were not built years ago.

C. E. SARGENT.

British Motorcycles

Editor, AUTOMOTIVE INDUSTRIES:

I am glad your correspondent, E. A. Wrigley, has no more serious criticisms to make of my report of the British Motorcycle Show than those he specifies in his letter in your issue of Jan. 29; surely they are mere quibbles.

He objects first to my terming the "Brough Superior" the "Rolls-Royce of British motorcycles" in a caption below an illustration of the "S S 80" model. Where is the "error" in that? It matters not which model is referred to, the resemblance to Rolls-Royce quality is equally evident. Perhaps Mr. Wrigley would rather I had said the "S S 80" was the "20 hp. Rolls-Royce of British motorcycles!"

Intentionally I referred to the "Victor" motorcycle, instead of "Coventry Victor." There is only one make of "Victor" machines and no misunderstanding was encouraged by the omission of the word "Coventry."

With regard to the price of the new B.S.A. sports model, the context clearly showed that a typographical error accounted for the figure £270 being given instead of £70; the latter (not £65 as Mr. Wrigley suggests) is the price of the model in question with a *guaranteed* output of 25 b.hp.

Finally, the Scott machines were not mentioned because they had already been described and illustrated in *Automotive Industries*, and the show report made no pretense of referring to every make or model of British motorcycles, new and continued. The space limitations imposed upon me prohibited that, even if it had been desirable.

M. W. BOURDON,
British Correspondent
Automotive Industries.

O-Z Stationary Tachometers

A LINE of stationary tachometers with 6-in. dial has been placed on the market by the O. Zernickow Co., 15 Park Row, New York. These instruments have an aluminum housing 2¾ in. deep and their net weight is 2¾ lb. with bracket. The operating principle is that of the centrifugal pendulum, the same as used in the O-Z hand tachometer. Standard ranges of from 2 to 16 times the minimum speed may be had. The maker recommends that the instruments be driven by coiled spring belts.

These instruments are made in two models. Model A has the hand mounted in the center and a circular graduation over the entire circumference of the dial. It is recommended for normal conditions and where a long open scale is desired. Model B has the hand mounted below the center and a semi-circular graduation. This type is especially made to stand rough usage and where violent speed fluctuations are encountered.

NEW DEVELOPMENTS—Automotive

Lavaud Has New Differential

A NEW type of differential, having the advantage of low cost of production and of providing traction when only one wheel has adherence, and also claimed to considerably improve the stability of the car to which it is fitted, has been produced in France by M. Sensaud de Lavaud. Built to interchange with the normal pinion type differential, the de Lavaud appliance consists of a cylindrical casting *A*, on the inside of which there are six grooves *B* of the form of a circular segment. Each of the two differential shafts carries on its splined end a cylindrical hub *C*, and between this and the grooves *B* are interposed six rollers *D*. The two sets of rollers—12 in all—are separated by an elastic cage, mounted with a frictional fit on the internal hubs. The elasticity of the two parts of this cage is due to a coil spring pressing two steel balls through a bore in the inner to a groove in the outer sleeve.

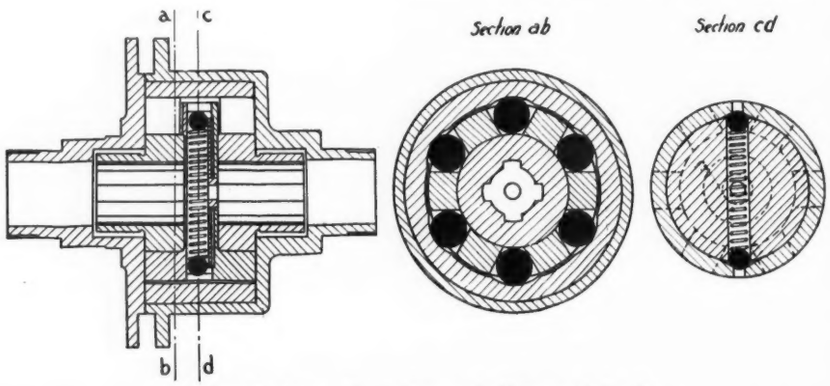
When driving either ahead or reverse, the rollers buttress in the grooves, this locking action being practically instantaneous, for it is assisted by the retarding friction of the cage on the axle shafts. Under a differential movement the wheel describing the greater radius moves faster and disconnects its six rollers, allowing slip to take place between the rollers and the inner hub. The six rollers on the inside of the curve remain buttressed in the groove and assure the drive. The elasticity of the cage is a fundamental feature of the mechanism, for it allows the rollers on one side to disengage, while those on the opposite side are engaged.

In making a turn without the use of the brakes the outer wheel becomes free as it progresses in relation to the inner one, and the propulsive effort is automatically transmitted to the inside wheel. As a consequence it is possible to pull out of the soft ground even if one of the wheels has completely lost adherence. The Lavaud differential has been fitted to trucks and has proved capable of doing the same work as a normal differential equipped with a lock.

When the vehicle overruns the engine, the two wheels tend simultaneously to advance in relation to the crown wheel. By reason of the friction between the axle shafts and the cage, the axle immediately drives both cage and rollers and these latter wedge in the grooves in the reverse position. Differential movement under these conditions causes the inside wheel to become free by lagging in relation to the opposite one.

Tests made with this differential indicate that it changes the stability of the vehicle and abolishes all tendency to shimmy. The slightest turning movement of the steering wheels automatically causes the propulsive effort to be transmitted to the wheel on the inside of the turn, with the result that a pivoting couple, tending to straighten up the car, takes place around the center of gravity, provoking lateral reactions on the four wheels and, by reason of the castering effect of the front wheels, causing these latter to return to the straight ahead position. This automatic correction gives the car a remarkable ability against skidding on really greasy road surfaces. One car with a very pronounced degree of shimmy at a speed of 35 m. p. h. was completely cured of this defect by fitting the Lavaud differential.

(Differentials having the general properties of the one described above have been known in this country for many years and have been used to a certain extent, especially on trucks. But the mechanism of the de Lavaud differential appears to be novel. The elastic cage arrangement would seem to be an awkward manufacturing proposition—Editor.)



Sectional views of de Lavaud differential gear

Machine Tool Coolant Pump

A NEW type of coolant circulating pump for machine tools is being manufactured by the Tuthill Pump Co., 131 W. Sixty-third St., Chicago, Ill. It is suitable both for equipment on new tools and for replacement purposes.

An internal gear formed integral with the driveshaft meshes with a spur pinion mounted on a stud secured into the pump cover. The space between the internal gear and the pinion is filled by a crescent which is also secured to the pump cover. Hardened and ground steel lands form a seal between the inlet and discharge sides of the pump and are held in place by light springs. As the teeth of the internal gear pass the upper seal, the teeth of the idler draw out of mesh and the spaces between the teeth fill with liquid. The liquid is thus carried in the tooth spaces from the inlet to the discharge side and is discharged from the tooth spaces as the idler teeth begin to mesh again with the teeth of the internal gear.

It is claimed for this pump that it gives a steady stream of coolant on the cutting tools. The lands also act as automatic by-passes. Should the delivery pipe become blocked for any reason, the pressure within the pump will build up and the pressure of the oil on the land will then exceed the spring pressure on it, which will cause the seal between the inlet and discharge sides to be broken, allowing the oil to by-pass within the pump. These balanced lands are said also to allow chips to pass

Parts, Accessories and Production Tools

through the pump without any injury to the wearing surfaces. Another feature of the pump is that, since both the inlet and the discharge ports are at the top, the pump is always filled with coolant and therefore requires no priming. The gears are made of steel and hardened, and the shaft and bearings are said to be of liberal design.

Single Sleeve Valve Gear

A REPRESENTATIVE of the Continental Motors Corp. has recently taken out in England a patent for a new method of actuating the single sleeves of Burt-McCullum engines, for which engine the concern secured world's rights about a year ago. With this engine a single sleeve is used, which, in addition to reciprocating axially, has an angular rocking motion in the cylinder. Several mechanisms for operating the sleeve have been worked out in the past by various licensees under the patents, and Continental has now added one more.

In this design use is made of the usual half-speed crankshaft, but the crankpins, instead of being parallel with the crankshaft, make an angle with it. Each crankpin connects through a connecting rod with a lever having a spherical pivot and also a spherical bearing at the middle of its length, and it is to this latter that the connecting rod is attached.

If the crankpin were parallel with the crankshaft axis, the sleeve would be merely reciprocated in a vertical direction. The angular arrangement of the crankpin causes the lower end of the rod to swing in a vertical plane through the crankshaft axis and thus the sleeve to rock in the cylinder.

With this mechanism the motion imparted to the valve sleeve can be varied by varying the throw of the crank, the angle between the crankpin axis and the crankshaft axis, and the proportions of the lever. It is claimed that the mechanism permits of providing adequate bearing surfaces so that wear should be slight and the backlash restricted.

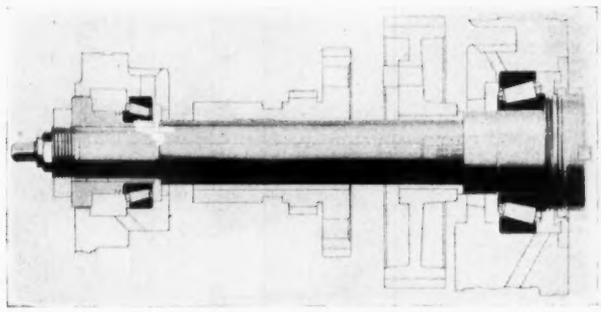
Thumbprint Car Identification

THE Thumprint Automobile Title Guarantee is the name of a new automotive theft protective scheme developed by Rankin National Protection Service, Los Angeles. This system, in brief, is a method to establish ownership of a car by fingerprint identification.

When a car is sold by a dealer the purchaser is given a title certificate on which his thumbprint has been placed and, apparently, another copy of the same print is forwarded to the home office of the agency for file. Should occasion arise to prove ownership in the car for the benefit of police authorities or others, the fingerprint of the supposed owner is taken and compared with that on the title certificate which is carried in the car. Another part of the service is the provision of small plates, designed for attachment to the radiator, which are expected to give, by means of a fairly simple code, a brief description of the owner of the car to which it is affixed.

Roller Bearings in Machine Tools

THE adoption of anti-friction bearings for use in machine tools has been under way for a number of years. In most instances, however, these bearings are being fitted only to shafts of the change speed gear, and not to the main spindle. In order that the work produced may be of the highest order of accuracy and have a good finish, it is absolutely necessary that the main spindle or cutter spindle should be rigidly supported. Machine tool builders knew that plain bearings gave a satisfactory support and they appeared to be loath to take any chances with anti-friction bearings at this important point.



Milling machine cutter spindle mounted on Timken roller bearings

Gradually, however, opinion on this subject is veering around, and the impression seems to be gaining ground that anti-friction bearings may give a more rigid support than is possible with plain bearings. As a consequence these bearings are coming into use also on the main spindles of machine tools. One of the latest firms to adopt them for this purpose is Kearney & Trecker Corp. of Milwaukee, which now mounts the cutter spindles of many of its milling machines on Timken roller bearings. Decision to take this step followed extended experimentation and research, including the use of a roller-bearing-spindled machine in its own shop since October, 1921. Ten models of the larger milling machines of this firm are now provided with Timken bearings on the cutter spindles, as per the drawing shown herewith, in addition to having bearings of the same type in the transmission gear train.

THE latest development of The Alexander Milburn Co., Baltimore, Md., is a triple-purpose spray gun which is suitable for use with siphon, pressure or gravity feed spray. The multiple head adjustment permits the use of either flat or fan-shaped sprays in vertical or horizontal planes as well as round spray.

The atomization is fine and an air pocket, formed by the fan-shaped nozzle, surrounds the atomized spray, thus lessening loss of material through evaporation. A trip lever is provided by means of which the paint supply can be cut off when air alone is required for dusting purposes. Both the air and paint valves are operated simultaneously by pulling the trigger.

U. S. Exports of Cars, Trucks, Tires and Parts

COUNTRIES	GASOLINE PASSENGER CARS										TRUCKS					
	Up to $500		$500 to $800		$800 to $1200		$1200 to $2000		Over $2000		Up to 1 ton		1 to 2½ Tons		Over 2½ Tons	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Austria			5	$3,417												
Azores and Madeira Islands	8	$3,808	1	753							4	$1,681				
Belgum	5	2,604	362	260,918	318	$356,184	110	$174,054	36	$95,916	99	43,430				
Bulgaria																
Czecho Slovakia			6	4,898	4	4,898			4	10,000						
Denmark and Faroe Islands	893	246,566	348	248,168	182	188,485	21	33,914	6	18,392	569	324,946	10	$10,400		
Esthonia																
Finland	10	5,170	37	25,023	42	43,928	13	21,150	4	9,048			14	23,751		
France			4	2,674	24	28,841	7	11,717	12	33,500	18	8,817				
Germany	449	58,326	157	112,217	336	365,614	31	47,801	66	183,659	10	339	7	5,485		
Gibraltar			1	880					1	2,500						
Greece	147	64,817			1	1,033					20	6,262				
Hungary			3	2,119									1	1,218		
Italy	66	23,023	5	3,758	1	1,158	1	1,500	2	7,125	50	13,026				
Latvia																
Lithuania																
Malta, Gozo and Cyprus			6	4,290												
Netherlands	1	250	35	22,190	66	68,663	16	25,888	11	33,806	1	797	3	5,780		
Norway	4	1,891	21	14,452	25	24,861	11	21,221	1	2,229			11	15,656		
Poland and Dantzig					4	4,564	1	1,914								
Portugal	15	6,901	8	5,335	9	9,624	1	1,640			5	2,725	3	2,264		
Rumania	30	13,890	27	19,567	32	33,848	1	1,500	5	12,500	40	18,460	1	1,255		
Russia					1	1,192										
Spain	130	57,607	168	119,728	159	164,702	70	110,949	24	67,337	408	191,462	48	51,971	1	$1,941
Sweden	19	8,744	217	145,425	71	74,418	26	41,468	3	7,325			36	46,787		
Switzerland					21	23,034	4	6,360	11	26,900			2	2,730		
Turkey			12	7,725	11	11,828	2	3,441								
United Kingdom	177	79,222	286	176,178	145	150,147	17	29,405	23	59,352	60	31,832	13	19,048		
Irish Free State					4	3,344					2	1,092				
Yugoslavia	13	6,778	5	3,766	2	1,834					2	923				
United States																
British Honduras	1	347									1	363				
Canada	59	19,570	406	248,970	198	199,831	113	168,812	89	254,348	49	30,677	112	131,944	33	99,974
Costa Rica			6	4,305	8	8,487			1	2,747	2	1,680	4	7,368		
Guatemala			4	2,892	18	19,237	4	6,051	3	7,867	14	6,337	17	18,505		
Honduras			3	1,955	1	1,183	1	1,675			1	904			3	6,000
Nicaragua			1	743	11	11,518					2	607				
Panama	27	11,494	19	12,339	13	13,190	4	6,319	1	3,000	16	7,837	1	1,973		
Salvador			9	6,546	6	6,165	1	1,867	2	5,000	10	4,090	2	2,394	2	7,965
Mexico	177	58,751	92	60,256	62	63,473	34	51,915	6	18,429	166	80,142	37	60,326	16	83,420
Newfoundland	1	418													1	4,117
Barbados			6	4,482	2	2,107										
Jamaica	29	11,820	13	8,639	17	18,265	3	3,726			39	16,440	11	13,559		
Trinidad			3	1,954	1	1,016	1	1,504					2	2,378	4	15,592
Other British West Indies	18	6,252	4	2,696	1	942	1	1,500	3	8,155	8	3,542				
Cuba	211	82,484	28	17,764	41	40,762	11	16,681	19	58,486	158	54,700	15	20,020	4	11,350
Dominican Republic	4	1,416	7	4,911	30	29,631			3	8,518	12	5,258	6	7,624		
Dutch West Indies	2	880			2	2,292					9	3,318	1	715		
French West Indies																
Haiti			11	8,414	3	2,958							1	1,604		
Virgini Islands	4	1,098														
Argentina	3,248	1,069,092	813	535,953	524	520,941	111	176,497	40	120,444	698	279,977	46	89,545	55	155,403
Bolivia			1	742	5	5,499	5	7,869	5	14,085						
Brazil	825	321,097	455	355,443	294	282,132	49	79,223	30	81,579	520	198,241	39	52,643	1	1,200
Chile	342	68,770	32	22,253	19	22,168	8	10,970	11	26,865	85	25,134	8	10,764	4	14,932
Colombia	34	13,034	41	29,666	77	81,862	22	33,290	21	65,507	45	27,818	75	117,909	13	41,726
Ecuador	2	776	3	2,193	2	2,096	1	1,425								
Brtish Guiana			2	1,365	1	1,147										
French Guiana																
Dutch Guiana																
Paraguay	3	1,046	2	1,446	1	928					35	11,014				
Peru	65	24,210	16	11,067	22	21,312	2	2,992			53	19,929	14	18,920	2	2,277
Uruguay	303	106,361	38	25,909	34	36,628	2	3,450	14	44,097	1	244	20	37,584	12	30,449
Venezuela	91	33,125	66	53,783	154	160,884	18	27,090	16	47,486	133	50,853	50	87,915	20	62,788
Aden																
British India			85	60,874	136	121,564	10	13,932	1	2,716	84	58,809	7	7,069		
Ceylon	1	581	24	17,279	39	39,024	3	4,186			22	15,859	3	3,393		
Strait Settlements	24	12,772	104	61,145	33	33,120			1	2,500			8	9,257		
China	44	16,188	16	10,282	9	8,997	9	14,151			60	25,922	9	13,843	2	3,959
Java and Madura	19	8,619	74	55,495	44	46,619	19	30,299	11	27,702	5	4,697	1	1,072		
Other Dutch East Indies	8	4,223	10	7,298	1	1,107	1	2,027	1	2,500			12	15,235		
Hejaz, Arabia and Iraq	10	3,540	1	762			2	3,303	1	2,327	7	5,336				
Hongkong	5	1,150									1	260				
Japan	196	90,685	16	12,729	52	54,566	7	11,022	16	43,265	101	48,266	2	5,096	2	14,525
Kwantung			8	5,985									1	1,393		
Palestine and Syria	36	12,492	9	6,716	9	9,630	4	5,816			15	7,014	6	5,874		
Persia							2	3,250			1	743	1	1,413		
Philippine Islands	26	11,453	37	26,032	57	58,397	15	21,110	9	25,152			28	34,544	3	8,048
Siam																
Turkey	5	2,336														
Other Asia					1	980										
Australia	908	413,796	1,048	705,744	800	824,761	82	128,064	51	134,627	1,607	771,933	562	602,212	138	269,888
New Zealand	50	23,991	131	96,398	195	207,783	16	26,556	9	22,396	56	24,208	37	48,356		
British Oceania	4	1,310														
French Oceania	2	415	5	3,778	1	1,000										
Other Oceania																
Belgian Congo											12	5,400				
British West Africa			6	3,732	9	9,036	4	5,927			44	50,786	219	233,932		
British South Africa	709	299,477	462	324,159	572	564,485	17	27,973	2	5,000	178	88,369	63	67,058	4	17,112
British East Africa	43	18,221	15	11,169	23	22,664	2	3,529			60	28,342	15	13,592		
Canary Islands			5	3,541	9	8,330			1	3,086					1	1,941
Egypt	88	38,215	78	56,767	61	61,933	16	25,717	2	7,523	137	55,142				
Algeria and Tunis																
Other French Africa	5	1,793	1	723							17	6,393	10	10,183		
Liberia	6	2,273									2	879				
Morocco	3	1,368			5	4,957					38	15,388				
Portuguese East Africa	2	1,062	4	2,881	6	6,022							1	857		
Other Portuguese Africa			1	860	1	963					4	3,009	1	869		
Spanish					2	1,943										
Total	9,607	$3,377,598	5,935	$4,084,516	5,070	$5,206,735	932	$1,463,640	578	$1,614,996	5,796	$2,691,652	1,596	$1,945,283	321	$854,607

for January, 1926 | Canadian Exports

ELECTRIC VEHICLES		PARTS	TIRES						PASSENGER CARS						TRUCKS		PARTS	COUNTRIES
			Casings		Inners		Solids		Up to $500		$500 to $1000		Over $1000					
No.	Value	Value	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value	Value	
		$2,790																Austria
		1,058	60	$670	62	$108												Azores and Madeira Islands
		112,596	131	3,440							2	$1,629					$2,669	Belgium
		1,410	400	4,080	400	750												Bulgaria
		4,256	268	12,208	47	136	58	$3,186										Czecho slovakia
		140,407	6,908	75,836	3,947	6,921	34	1,387			2	1,888	4	$4,640			7,055	Denmark and Faroe Islands
		315	21	247	21	38												Esthonia
		27,545	349	5,757	435	1,081												Finland
		34,888	348	7,902	258	813	4	104			5	3,516						France
		281,280	13,413	181,233	9,988	25,966					4	2,921	40	56,118			7,141	Germany
		1,470																Gibraltar
		10,378	166	2,150	93	160												Greece
		2,800	65	556					1	$499	1	693						Hungary
		126,504	1,384	16,487	1,168	2,533			2	834								Italy
			30	282	30	49												Latvia
		100																Lithuania
		911	2	49			4	112	15	5,106								Malta, Gozo and Cyprus Is.
		63,519	2,715	40,390	1,043	2,377											155	Netherlands
		12,132	704	18,103	487	1,151	25	1,490	9	4,353	5	4,778	2	2,279				Norway
		824	1,418	20,636	1,087	2,001	4	147			1	944						Poland and Danzig
		25,496	1,064	11,033	360	626	5	169										Portugal
		9,965	649	7,033	816	1,496			100	41,680			9	11,113	36	$13,985		Rumania
		74																Russia
		202,762	5,380	81,640	1,925	4,094	546	14,880					1	1,181				Spain
		75,923	2,416	37,259	1,260	2,233	1	31										Sweden
		5,577	788	11,795	570	2,325	10	345										Switzerland
		6,447	9	160	8	24	27	1,133										Turkey
4	$3,888	390,776	16,711	257,966	6,535	18,572	3,585	79,106	54	18,060	391	284,854	125	157,778			50,919	United Kindom
		46,815	2	48													1,053	Irish Free State
		3,808	150	1,173	150	206			4	1,667							27	Yugoslavia
									4	850			1	1,475	1	200	29,021	United States
		4,145	28	344	45	87												British Honduras
3	6,897	2,640,985	586	15,023	2,366	5,925	30	1,249										Canada
		1,914	511	7,323	282	769	22	183							32	12,390		Costa Rica
		12,273	601	12,440	514	1,485	18	571	1	493	1	940	5	5,767	6	2,147	54	Guatemala
		2,843	145	2,353	83	169	34	1,810					1	1,223			47	Honduras
		1,591	4	72	4	11			3	1,458	3	2,820	4	4,679				Nicaragua
		19,677	2,371	26,426	504	1,158	158	4,858					7	8,171			158	Panama
		6,851	366	6,026	216	567	62	2,233	1	405	1	572			4	1,549	21	Salvador
		326,794	9,285	108,987	7,318	12,846	246	5,589			2	1,926						Mexico
		948	7	82													228	Newfoundland
		3,459	90	911	41	75			7	2,313	3	2,295						Barbados
		16,106	39	1,086	1	2	49	1,235	24	9,725	1	855	4	4,601	4	1,549	68	Jamaica
		12,088	265	4,103	120	333	14	406	11	3,737	6	3,460	3	3,304	12	4,654		Trinidad
		5,829	142	1,654	81	147	16	283	5	2,117	4	2,395			2	812	216	Other British West Indies
		76,643	11,204	108,720	7,523	12,011	774	17,324					15	17,055				Cuba
		14,772	1,124	15,693	309	676	62	2,615			2	1,888	2	2,311				Dominican Republic
		4,215	179	2,140	189	490			3	1,215					4	1,551	7	Dutch West Indies
		394	80	2,324	18	57			2	810								French West Indies
		10,845	608	8,155	333	864			4	1,661					4	1,549		Haiti
		623	21	199	15	29												Virgin Islands
		304,336	28,221	313,699	23,583	53,631	970	30,261	330	156,362	78	61,794	19	22,057			93,071	Argentina
		14,295	327	6,134	332	931												Bolivia
		379,192	26,607	264,989	19,177	42,897	155	5,036	16	7,680	30	27,550	6	7,181			4,418	Brazil
		77,137	3,220	48,396	2,426	4,702	88	3,216	26	10,800	8	5,775	11	13,810	37	14,370		Chile
		55,213	2,043	44,738	2,238	7,958	38	2,155	26	10,767	3	2,833	20	23,187	106	42,115	435	Colombia
		2,175	323	4,789	262	604	10	312			1	958	2	2,309				Ecuador
		2,049	113	1,480	70	115			8	3,515	1	543			4	1,014	103	British Guiana
		10																French Guiana
		173	22	201	24	44	11	194										Dutch Guiana
		1,614	101	1,938	100	225					2	1,920			4	1,549		Paraguay
		36,538	1,183	20,959	1,058	3,582	51	755	5	2,175	2	1,927	10	13,593	42	16,240		Peru
		47,732	4,514	49,108	890	1,516	74	3,853	75	36,640			7	9,027			306	Uruguay
		63,358	1,677	32,325	1,081	3,053	32	1,100	49	20,150	6	5,593	6	6,687	100	38,616	20	Venezuela
		234	56	504	60	91			1	329								Aden
		69,923	4,900	56,207	1,306	1,804	687	17,549	424	165,968	39	28,835	7	8,873	418	140,720	15,345	British India
		14,017	1,100	12,849	528	1,282	78	2,556	63	27,577	4	2,240	1	1,413	57	17,916		Ceylon
		40,586	5,580	56,912	61	124	319	7,480	14	5,686	25	23,333	3	3,339	18	4,726		Straits Settlements
		35,837	2,591	32,537	613	1,536	60	1,675			18	16,085	2	3,003			149	China
		35,511	4,332	58,769	1,662	3,429	159	5,802	206	76,058	41	36,354	25	29,522	75	18,597	1,280	Java and Madura
		19,596	531	7,189	341	811												Other Dutch East Indies
		8,612	250	2,451	175	389	20	700	6	2,501								Hejaz, Arabia and Iraq
		2,506																Hongkong
		319,008	6,084	52,211	3,639	5,476	743	13,815			33	30,301	5	5,716				Japan
		1,367																Kwangtung
		18,778	742	11,779	550	1,503												Palestine and Syria
		4,389	550	9,430	694	1,849	72	2,978										Persia
		48,324	6,002	74,023	3,146	6,507	224	5,922										Philippine Islands
		7,812							4	1,623					148	52,556		Siam
		3,796	303	3,192	306	583												Turkey
																		Other Asia
		380,056	3,568	68,165	174	515	335	17,727	2,144	527,205			8	11,196	506	150,784	98,454	Australia
		109,548	713	11,482	188	453	147	4,279	232	82,071	12	6,360			222	78,078	29,305	New Zealand
		1,923	18	315	12	34			13	4,286			2	2,348	10	2,957	705	British Oceania
		862	34	615	18	105	8	250										French Oceania
											8	4,582						Other Oceania
		8,881																Belgian Congo
		30,607	629	10,363	619	1,935			36	14,502	2	1,370			69	23,225	7,547	British West Africa
		149,443	1,167	18,986	283	669	79	2,216	215	80,743	4	2,740	3	4,162	214	69,331	8,904	British South Africa
		10,623	792	13,766	516	1,252			19	7,702	1	810			23	8,209	4,039	British East Africa
		6,201	679	10,065	317	746	60	2,236	3	1,422			1	1,246	4	1,558		Canary Islands
		112,717	406	6,698	230	598	240	7,790	3	1,337			8	9,403			472	Egypt
		1,083	38	906	32	55	10	284										Algeria and Tunis
		16,315	68	1,800	72	298												Other French Africa
		931	89	1,051	89	182												Liberia
		1,288									2	1,168	2	2,950				Morocco
		3,564	76	3,069	162	884	4	80										Portuguese East Africa
		3,267	102	714					3	1,250					8	3,108	1,500	Other Portuguese Africa
		6,168																Spanish Africa
7	$10,785	$7,213,416	192,959	$2,436,998	517,686	$263,729	10,462	$280,667	4,171	$1,345,332	754	$581,445	371	$462,717	2,170	$726,055	$364,892	Total

AUTOMOTIVE NEWS SECTION INDUSTRIES

Philadelphia, Pennsylvania

Saturday, March 12, 1927

Production Gains Bring Many Plants to Capacity

PHILADELPHIA, March 12—Motor car and truck production has been speeded up this month, and a large proportion of companies are on a capacity basis. February was better than a year ago for most manufacturers except Ford, and further improvement is under way, although the total for the industry is necessarily affected considerably by the slow rate of Ford operations. Some progress has been made in curtailing used car stocks and continued betterment in this respect should have a tonic effect.

In respect to used cars, the eastern dealers are in better condition generally than those in the south and west. Turnover in the cotton states has been particularly slow, while business in Florida this year has of course been well under last winter's level.

With motor car and truck exports since the first of the year showing notable gains, the outlook for this branch of the business is being regarded most favorably. An increasing tendency toward foreign assembling and even manufacturing operations is observed, experience having shown that not only the economies of such operations but the good will obtained through them have been a notable aid to sales.

A considerable proportion of the cars turned out by American manufacturers and American capital in foreign countries do not get into the present statistics of motor car production and export and the need is being felt for a more accurate gage of the extent of actual overseas business.

The price situation, although a topic of widespread discussion, has remained fairly stable. If there has been a trend it has been downward, but so far the reductions have been regarded more in the light of adjustments to meet particular problems. The big producers are strong believers in the policy of making no price changes immediately before or during the most active selling season and there has appeared no good reason for a departure from the policy.

Murray Orders Steel for New Ford Bodies

PITTSBURGH, March 10—Murray Corp. of America has started production on a new body for Ford Motor Co., orders for steel having been placed with sheet makers here, according to Dow, Jones & Co. Mills supplying the steel are without information as to the type of chassis on which the bodies will be used but it is generally believed a refinement of the present model is to be marketed and not an entirely new type of car. Whether the refinement will include a selective gear shift is not disclosed, though reports have carried that such gears are to be furnished the Ford company by a leading parts maker.

Rim Output Shows Gain Over January

CLEVELAND, March 10—Rim production in February totaled 1,753,224 as against 2,168,223 in February, 1926, according to the monthly statement of the Tire & Rim Association of America, Inc. January, 1927, production was 1,489,018.

Production of principal sizes for February, 1927, and February, 1926, was as follows:

Rim Size	1927	1926
Clincher		
30x3½	76,665	315,213
Balloon		
28x3½	625,162	783,747
28x4	249,745	209,626
29x4	205,558	374,846
30x4½	107,871	189,635
30x5	22,739	31,401
31x5	28,995	65,071
High Press.		
30x3½	12,213	9,064
32x4	16,125	19,625
32x4½	8,827	38,217
Truck "20"		
30x5	135,571	27,629
Truck "24"		
34x5	.....	964
36x6	1,528	9,745

N.A.C.C. to Help Meet World Motor Problems

NEW YORK, March 10—In his first statement as president of the National Automobile Chamber of Commerce, Roy D. Chapin indicated that the broad constructive policies of Charles Clifton, honorary president, will be continued. Mr. Chapin said he looked for a great increase in the world use of automobiles, the chamber, he said, joining with manufacturers of Europe to assist the undeveloped countries in meeting problems affecting automotive use.

Hudson on 37,000 Month

DETROIT, March 6—Hudson Motor Car Co. plans to produce 37,000 Hudson-Essex cars in March. The company reports that it had the greatest February in its history, shipping 27,000 cars.

EXPORTS IN 1927 TO EXCEED 600,000

NEW YORK, March 10—Export sales of American motor vehicles will exceed 600,000 in 1927, according to John N. Willys, chairman of the foreign trade committee of the National Automobile Chamber of Commerce, in his report to members.

Mr. Willys bases his belief on improved conditions in some countries, notably England and Argentina, and upon improved merchandising systems and better relations in the export field generally. Temporary competitive advantages gained by some automotive producing countries through depreciated currency have been largely corrected, he said.

H. C. Harrison Dies on European Trip

LOCKPORT, N. Y., March 8—Herbert C. Harrison, president of the Harrison Radiator Corp., a subsidiary of General Motors Corp., died suddenly Saturday in London, England, news of his death being cabled to his family here. Mr. Harrison had gone abroad recently on a business trip. In 1910 Mr. Harrison organized the Harrison Radiator Co., the name later being changed to the Harrison Radiator Corp. and becoming a division of United Motors, with which it became part of General Motors Corp. The company supplied radiators to all General Motors car divisions and to a number of other leading car manufacturers.

Mr. Harrison was 50 years old. He was born in Calcutta, India, where his father was controller general of the Indian Civil Service. He was educated at Rugby and Oxford, graduating from Trinity College in 1900 with honors in chemistry. After gaining experience in metallurgy he came to the United States in 1907 as vice-president of the Susquehanna Smelting Co.

Grahams Buy Libbey-Owens

NEW YORK, March 10—Libbey-Owens Securities Corp. has been formed with a paid-in capital of $7,000,000 to acquire an interest in the Libbey-Owens Sheet Glass Co., Toledo, at a cost of $10,900,000, according to announcement by the Graham Brothers Corp. Practically the entire production of polished plate glass by the company is taken by the automotive industry and much of the sheet glass is used in lower priced cars. Ray A. Graham is president of the Securities company.

Mellon Hearkens to Car Tax Plea

Administration Not Classing Automobiles With Tobacco —Seeks Revenue Assurance

WASHINGTON, March 10—Data compiled by 17 allied automobile industries, accessory manufacturers, finance companies, body builders, etc., asking repeal of the 3 per cent excise tax on passenger cars, was this week presented to Secretary of Treasury Mellon by Congressmen James C. McLaughlin, member of the House ways and means committee, and C. J. McLeod, both of Detroit.

They informed the Secretary that the emergency in which the tax was originally placed on automobiles no longer exists and that Michigan, and more particularly Detroit, the center of the industry, realizes that the tax has been levied long enough, "in the face of the great surplus now in the Treasury Department."

Specifically the Treasury was asked to take the initiative in the repeal of the tax next October when the House ways and means committee meets to formulate the tax program for the new Congress, meeting in December. Mr. Mellon assured them that it was the intent and purpose of the Treasury Department to remove the automobile excise tax "as soon as the administration is assured of sufficient revenue from normal taxes." He said the administration did not class the automobile excise tax with the tax on tobacco and possibly the theatre tax.

Timken Bearing Reports $8,474,103 Profit in 1926

CANTON, March 8—Net profits of Timken Roller Bearing Co. for the year ended Dec. 31, 1926, after reserves for Federal taxes, were $8,474,103. This compares with $8,088,338 in 1925. Cash dividends paid during 1926 aggregated $5,403,969 and a balance of $3,045,120 was transferred to surplus. The balance sheet showed cash and securities amounting to $15,486,987, which with accounts receivable and inventories brought current assets to $21,965,654. Current liabilities were $2,791,973, The company has no mortgage or funded indebtedness. The sum of $700,000 was expended during 1926 for improved machinery and equipment and approximately $1,500,000 will be expended during 1927.

Sales of bearings to automotive and other manufacturers were approximately double that of 1925 and the same increase is anticipated for 1927, the report showed.

Midland Makes Promotions

CLEVELAND, March 8—E. J. Kulas, president of the Midland Steel Products Co., announced promotions of three officers, following the annual meeting of the company. Gordon Stoner, secretary, was elected a vice-president; F. K. Conrad, assistant secretary, was made treasurer, and H. F. Kulas was elected secretary.

These advancements came upon the heels of the resignation of Ludwig Kemper as vice-president and treasurer. Mr. Kemper has also resigned as treasurer of the Otis Steel Co., effective March 31.

New Dodge Showing Scheduled for July

DETROIT, March 10—Dodge Brothers dealers have been advised that the new supplementary line will be available for moderate retail deliveries about July 1. The four-door sedan of the new line will sell for $1650. No announcement is made as to engineering features of the car but it is accepted as being a six-cylinder model.

The announcement of the date of the appearance of the car is made in response to the many inquiries which are reported to have been received by dealers. Assurance is again given that the new line will be supplementary to the present line and that reports inconsistent with this statement are false and misleading.

Chandler Adds 4 Models on Royal Eight Chassis

CLEVELAND, March 10—Chandler-Cleveland Motors Corp. has added four new body models on its Royal Eight chassis, making the line now complete with five models. These are five and seven-passenger sedans, four-passenger coupe, seven-passenger touring and a sport roadster with rumble seat. The seven-passenger sedan lists at $2295 and the others at $2195.

Optional upholstery of mohair or broadcloth is available in the closed models. Upholstery of the open models is tan hand-buffed leather. Several color options are offered on the closed models and on the touring. The roadster is finished in two-tone fawn.

Production is now being speeded, the factory reports in response to demands from dealers in all parts of the coun-

Seiler Names Assistants

DETROIT, March 9—Four executives of the Ternstedt Mfg. Co., who left that organization to join Paul W. Seiler, new president and general manager of the Yellow Truck & Coach Mfg. Co., are acting as his assistants in various departments of the company as follows: M. T. Boden, accounting; D. E. Humphrey, sales; H. O. Buelteman, purchasing, and E. E. Heintz, engineering.

Ritchie Goes Abroad

NEW YORK, March 8—John A. Ritchie, vice-chairman of Yellow Truck & Coach Mfg. Co., sailed for Europe Saturday on a vacation trip covering several months.

Business in Brief

Written exclusively for AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co., second largest bank in America.*

NEW YORK, March 10—General trade activity apparently continued last week at about the same level as had prevailed for several weeks preceding. Bad weather was an adverse factor in a number of sections. Some important lines of industrial activity, notably iron and steel production, showed moderate expansion. Both stock and commodity prices moved generally toward higher levels, while money rates were slightly firmer.

FREIGHT CAR LOADINGS

Car loadings during the week ended Feb. 19 numbered 960,873, as compared with 968,317 in the preceding week and 932,281 in the corresponding period last year. Loadings of coal were 43,881 cars above the total of a year ago.

BANK DEBITS

Bank debits to individual accounts reported to the Federal Reserve Board for the week ended March 2 were 36.1 per cent larger than the total for the preceding week (a holiday week) and 5.3 per cent above that for the similar period a year ago.

FISHER'S INDEX

Fisher's index of wholesale commodity prices stood at 142.1 last week, as against 141.4 a week earlier. and 144 four weeks earlier. Dun's index declined 1¼ per cent during February.

FEDERAL RESERVE STATEMENT

Bills and securities held by the Federal Reserve banks increased $51,300,000 during the week ended March 2, with gains of $36,700,000 in discounts, $8,800,000 in open market purchases and $5,800,000 in holdings of Government securities. Note circulation increased $8,600,000, deposits $74,900,000 and reserves $2,900,000. The reserve ratio declined from 80.1 to 78.5 per cent.

During the same period, loans of reporting member banks increased $150,000,000, with gains of $102,000,000 in loans secured by stocks and bonds, $2,000,000 in loans secured by Government obligations and $46,000,000 in "all other" loans. Investments rose $48,000,000, borrowings from the Federal Reserve banks $36,000,000, net demand deposits $156,000,000 and time deposits $60,000,000.

CALL LOAN RATE

The call loan rate ranged from 4 to 4½ per cent last week, as against 3¾ to 5 per cent a week earlier. Time loan rates were unchanged at 4⅜ to 4½ per cent, while rates on commercial paper were slightly higher at 4 to 4¼ per cent as against 3¾ to 4¼ per cent in the preceding week.

January Exports Gain 13 Per Cent

Increase to $30,349,822 Brings Total to Highest Since April, 1926

WASHINGTON, March 7—Automotive exports from the United States during January amounted to $30,349,822, or a gain of 13 per cent over the total for January, 1926, it was announced here this week by the U. S. Department of Commerce. The number of units shipped in January were 22,122 passenger cars and 7713 trucks, the largest exports of both types since April of last year.

Total passenger car shipments exceeded the December figure but the unit value dropped from $738 to $712. Shipments of motor trucks and buses registered approximately 100 per cent increase over December, the unit value, however, dropping from $843 to $712.

Argentina replaced Australia in January as the leading market for American passenger car exports. Argentina consumed 4736 units and Australia 2889 units. British South Africa and Brazil were third and fourth.

Shipments of automobile engines for passenger cars, trucks and buses were more than double those of December, reaching a total of $678,000, while exports of motor trailers increased more than 200 per cent. Automobile parts were also above the exports for both December and January, 1926. Motorcycle shipments showed a slight decrease as compared with December.

Canadian Exports Show Increase in January

WASHINGTON, March 9.—The Canadian automobile industry in January showed increased production and larger exports, the U. S. Department of Commerce has been advised. January exports of Canadian passenger cars and trucks totaled 7466 units, as compared with 5620 in December and 5159 in January, 1926. Production of passenger cars, trucks and chassis in January totaled 15,376 units, as compared with 7752 in December and 15,479 in January, 1926.

During January, 1927, almost 49 per cent of the Canadian automotive production was exported, as compared with 33 per cent in January, 1926, and 73 per cent in December, 1926, Australia retaining her position as the leading Canadian market for both passenger cars and trucks.

Carter Sets Month Mark

ST. LOUIS, March 8—Carter Carburetor Corp. reports February shipments of 120,000 carburetors, the highest production point the company has ever reached. The new capacity operations are made possible through plant additions and new equipment made available in 1926.

GAS TO DRIVE NEW GERMAN ZEPPELIN

WASHINGTON, March 7—Construction of a Zeppelin which is to be driven by gas instead of liquid fuel and to be used in trans-Atlantic trips from Spain to South America has been started at the Zeppelin works, Friedrichshafen, Germany, the U. S. Department of Commerce was advised this week.

The use of a propelling gas having approximately the specific gravity of air is contemplated, although the type of gas has not yet been determined. As the gas is consumed its place will be taken by air, thus preventing the great loss of weight now caused by the burning of liquid fuel.

Switzerland Seeks Higher Duty Rate

PARIS, Feb. 25 *(by mail)*—An effort is being made in Switzerland to stir up an agitation in favor of increased import duties on automobiles in order to allow a national automobile industry to be developed. It is maintained that if the present tariff wall were made higher the existing factories could find an important outlet on their home market.

Facts do not bear this out, for Switzerland possesses only three manufacturers, Saurer, Martini and Berna, with Motosacoche as an important motorcycle manufacturer. Saurer, who produces trucks only, has a factory in France which is more important than the one in Switzerland, while Martini and Berna pay little attention to private cars.

While possessing practically no automobile industry, Switzerland has a favorable export balance particularly to the United States and attempts to erect an artificial barrier to favor the development of an automobile industry will doubtless be resented by other home business interests.

Hungary Plans National Tax

WASHINGTON, March 9—The Hungarian Government has drafted a bill for a national tax on automobiles to replace the varying taxes now levied independently by the provinces, the U. S. Department of Commerce was advised this week. The revenues from the proposed state tax will be devoted to road building. The proposal has caused vigorous protest from automobile owners, dealers and manufacturers and from the Hungarian Royal Automobile Club, all of whom demand a reduction of the proposed rates.

Climax Names Exporters

NEW YORK, March 8—Climax Engineering Co. has appointed the Koehring Company Associates to handle the sale of its products abroad.

France Shows Gains in Exports in 1926

Imports Decline 34 Per Cent While Shipments Increase 26.6 Per Cent

NEW YORK, March 7—Although a slight let-up was noticeable in the activities of the French automobile industry during the last few months, due, no doubt, chiefly to the rapid appreciation of the franc, the year 1926 was most satisfactory for the French industry. Imports of foreign automobiles which have never been heavy, declined further, while exports gained more than 25 per cent on a weight basis.

Imports of motor vehicles and chassis amounted to 159,329 quintals in 1926, as compared with 242,482 quintals in 1925, a decrease of more than 34 per cent. The principal countries of origin of cars imported into France in 1926 were as follows: The United States, 2910 cars; Italy, 2014 cars; Belgo-Luxemburgian Customs Union, 192, and Great Britain, 139.

French automobile exports in 1926 attained a volume of 977,677 quintals, as compared with 771,556 quintals during 1925, a gain of 26.6 per cent. This heavy gain was undoubtedly due in large part to the inflation of the French currency in the course of the year, which enabled French manufacturers to offer their products in foreign markets at very attractive prices.

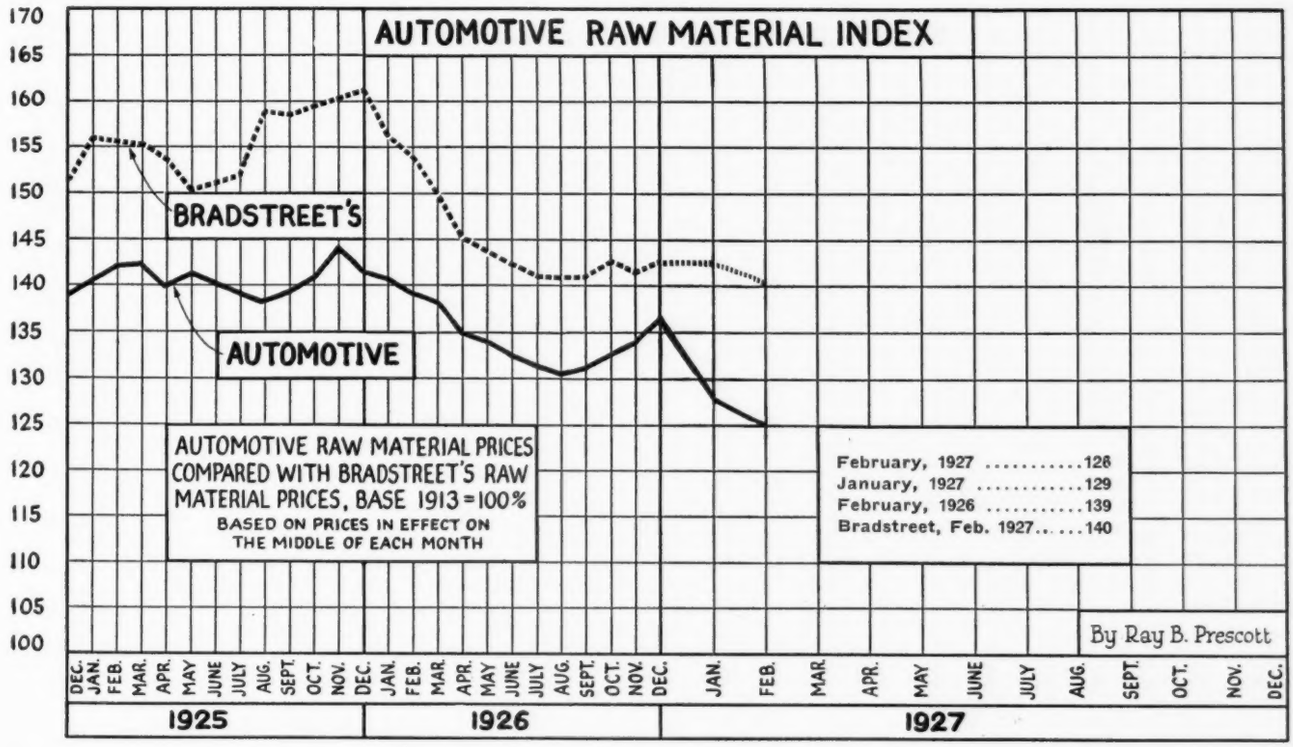
First among the foreign customers of the French automobile industry is the Belgian - Luxemburgian Customs Union, which took 8423 cars; then follow Spain with 8379; Algiers with 5730; Great Britain with 5461; Switzerland with 4657; Indo-China with 2895; Morocco with 1851; Netherlands with 1712; Germany with 1630; Italy with 1561; French West Africa with 1121; Portugal with 1118; Czechoslovakia with 1009; Argentina with 886; Tunisia with 487; Japan with 440. The United States took 196 French cars last year. The imports and exports by classes for both 1925 and 1926 are given in the following table.

	Imports Quintals		Exports Quintals	
	1926	1925	1926	1925
Passenger	146.989	225.458	832.200	652.919
Commercial	1.669	5.357	197.098	108.387
Bodies, chassis, etc.	10.671	11.667	8.379	10.250
Total	159.329	242.482	977.677	771.556

India to Reduce Tariff

WASHINGTON, March 10—The new budget estimates of the Government of India will include revised import duties on passenger automobiles and tires, the U. S. Department of Commerce has just been advised from Bombay through the Department of State. It is proposed to reduce the import duties on automobiles from 30 per cent ad valorem to 20 per cent ad valorem and on tires from 30 per cent ad valorem to 15 per cent ad valorem.

Raw Material Prices Continue Lower



Ford Planes to Carry Detroit-Buffalo Freight

BUFFALO, March 5—Ford Motor Co. will start daily freight service to Buffalo by airplane, landing at the city's new airport at Cheektowaga, as soon as arrangements have been completed with Canada for planes to fly over Ontario, W. B. Stout said. These negotiations are virtually completed, and the service should be started not later than July 1.

It was intimated the Ford company would utilize the Buffalo airport in a service it contemplates to Boston, New York and other eastern points. Whether the company would run its own planes through to the East or have connections with another eastern organization has not yet been determined.

Soon after Mr. Stout made his announcement the Ford plane which arrived Thursday departed for Boston. The big metal bird is carrying a crated Ford automobile which will be assembled at the opening of the new company unit at Boston. The flight from Dearborn to Buffalo was made in an hour and 23 minutes.

Opens New Somerville Plant

BOSTON, March 7—Ford Motor Co. opened its new assembly plant at Somerville today. As an incentive to attract callers—and also to get a good prospect list for Ford dealers—it was arranged to bring a car to Boston by airplane to be given away at the end of the week.

Visitors to the plant during the week will receive cards. Each person must fill out the name and address before starting on the inspection trip. The cards will be filed away, and on Saturday one of them will be drawn from the group. Whatever name is on it will be awarded the new car.

Nash to Add 3 Bodies on Three Chassis Models

CHICAGO, March 7—Three distinctive new models, a cabriolet on the Special Six chassis and a coupe and a sport touring on the Advanced Six chassis, are announced to appear late in March or early in April by Nash Motors Co. The Special Six cabriolet, which will be priced at $1290, is of the convertible type. The Advanced Six coupe, priced at $1775, has low forward sweeping body, French-type back and roof and graceful rear deck. A rumble seat is also provided.

The new Advanced Six sport touring, priced at $1540, is provided on the full 127-in. wheelbase Advanced Six chassis with wire wheels as standard equipment. The Burbank top of the sport touring is fashioned at the rear and in a forward sweeping curve giving the car the new characteristically Nash French-type back.

White Adds 2-ton Model

CLEVELAND, March 6—White Motor Co. has added a new two-ton truck priced at $3125. The new truck is known as Model 56. It has a new engine with removable head, straight line drive, new frame, new oiling system, single reduction axle and air cleaner.

Two 6-Cylinder Engines in New Fageol Bus Model

SAN FRANCISCO, March 8—Two 3¼x4¼ in. six-cylinder engines, seating capacity of 43 passengers and a gross weight of 13,000 lb. are among the features of a new bus built by F. R. Fageol. The engines are located at the side of the chassis outside of the frame channels and about midway between the wheels. Each engine has its own clutch and transmission and drives the wheels through independent worm reductions at each side of the rear axle. Externally the bus has much the appearance of a street car. Folding doors are provided front and rear. Throttle, clutch and transmission controls are interconnected.

The wheelbase is 203 in. and the overall length of the vehicle 31 ft. 6 in., the driver being several feet forward of the front axle. The turning radius is 34 ft. and the top speed is in the neighborhood of 55 m.p.h. Westinghouse metal-to-metal brakes are employed on all four wheels.

Guayule to Show Increase

TORREON, MEXICO, March 8—Guayule rubber production in northern Mexico will show a large increase over that of last year, if no interruption occurs to the factories now in operation nor to others that are to be constructed during the year. The Mexican Crude Rubber Co., which is owned by Detroit interests, plans to enlarge its manufacturing plant at Viesca, near here, and to construct two or more other factories for crude rubber extraction.

Men of the Industry and What They Are Doing

Cadillac Officers Aid in LaSalle Unveiling

The public unveiling of the LaSalle car, companion to the Cadillac, was staged at the Copley-Plaza Hotel, Boston, in connection with the holding of the Boston show and in the presence of A. P. Sloan, Jr., president of General Motors Corp., Lawrence P. Fisher, president of Cadillac Motor Car Co., and other officials of the Cadillac company and General Motors Corp.

The christening was done by Miss Anna A. Danforth, daughter of A. L. Danforth, president of the Cadillac Motor Car Co. of Boston. Mr. Danforth presided at the dinner served in connection with the event. Dealers from all parts of the New England and eastern territory attended. Other Cadillac officers attending were Lynn McNaughton, vice-president; H. M. Stephens, general sales manager; W. W. Lewis, A. U. Widman, and W. T. Taylor.

Llewellyn Joins Seneca

George W. Llewellyn has been appointed Detroit district sales manager of the Seneca Iron & Steel Co., resigning all his other connections to confine himself to the company's affairs in Michigan. G. M. Baird will continue to be associated with the Detroit office and Harry J. Ward, formerly of the Detroit office will cover the western Ohio and Indiana territory with headquarters at Toledo. Mr. Llewellyn's headquarters will be in the General Motors Building.

Taylor Leaves Franklin

Albert M. Taylor, recently appointed sales promotion manager of the H. H. Franklin Mfg. Co., has resigned to become advertising manager of the Copeland Refrigerator Co., Detroit. Mr. Taylor is a veteran in the advertising business and for several years has specialized in automobile work. He first came to the Franklin company six years ago as stock sales promotion man. Resigning this position he became advertising manager of the Velie company.

Lally Named Sales Head

C. V. Lally has been appointed general manager of sales of the Pittsburgh Steel Products Co., succeeding R. R. Harris, resigned. Mr. Lally has been manager of the Detroit office of the National Tube Co. and has been associated with that company in the sales office for the past 17 years.

Worker Sales Manager

Joseph G. Worker has been appointed general sales manager and elected a director of the American Engineering Co., Philadelphia. For the past five years, Mr. Worker has been assistant to the president. Formerly he was associated with Westinghouse.

R. P. Page, Jr.,

New president of the Autocar Co., succeeding L. L. Woodward.

Hartz Joins Studebaker

Harry Hartz, 1926 racing champion, has been retained by the experimental and research department of the Studebaker Corp. to perform special testing work in connection with the research laboratory and the proving ground. As a racing driver Hartz has been known for his mechanical skill and knowledge of racing and racing engines, his rise to fame being due in part to the fact that he was able to keep his racing cars in perfect condition.

Barr Export Manager

John F. Barr has been appointed export manager of Chain Products Co., Cleveland, and its associated industries. Mr. Barr formerly was with Sargent & Co., hardware manufacturer, in an export capacity. G. C. Wiseman has been appointed district representative.

Hillman With Owen-Dyneto

Max G. Hillman has joined the Owen-Dyneto Corp. as special representative in the Detroit territory. Mr. Hillman has been in the industry for the past 20 years, serving with the Willard and Prest-O-Lite companies, during which service he has become widely known.

Kissel on Coast Trip

G. A. Kissel, president of Kissel Motor Car Co., is on a business trip to California to confer with leading Kissel dealers and distributors in that section. The Kissel factories are resuming normal production. Officials report sales much improved.

Goldie New Sales Head of Nice Ball Bearing

Rowland J. Goldie has been appointed assistant general manager and director of sales of the Nice Ball Bearing Co., Philadelphia, manufacturer of thrust bearings for the automotive industry, and anti-friction bearings for industrial uses. Mr. Goldie recently resigned as vice-president and general manager of Ruggles Motor Truck Co. Previously he had been associated with Columbia Axle Co. as factory manager, and with the Timken and Chalmers organizations.

The Nice Ball Bearing Co. is planning extensive expansion of its present lines and also the development of several new devices in which Mr. Goldie will have active part. An addition to the plant is now being completed and a large amount of new equipment being installed.

Velie Names District Men

The appointments of F. L. Bruington and Frank J. Durling as district representatives in the Dallas and Philadelphia territories respectively have been announced by Velie Motors Corp. Mr. Bruington was formerly associated with the Willys-Overland and Nash companies, and Mr. Durling has served with Wills Ste. Claire, Oakland and with the former Saxon and King companies.

Robins Names Walker

Capt. F. V. Walker has been commissioned to organize and supervise the distribution of products in Japan represented by the H. M. Robins Co., of Detroit. Capt. Walker has been a resident of Japan for 19 years, most of which time has represented Sir Thomas Lipton in the tea business.

Van Cleef in Japan

Noah Van Cleef, of Van Cleef Bros., who is a director of the Automotive Equipment Association and a former president of the Automotive Manufacturers' Association, is in Japan on a vacation tour.

Willems Export Counsel

Edward G. Willems, newly appointed export counsel of the H. H. Franklin Mfg. Co., will go to all parts of the civilized world in fulfilling his new duties. He leaves this month for Cuba, Porto Rico and South America.

McDowell With Stearns

R. C. McDowell has been appointed assistant sales manager of the F. B. Stearns Co. Mr. McDowell previously was with the Stephens Motor Car Co.

J. F. Schaefer Promoted

John F. Schaefer has been appointed general manager of the Cooper Corp. and its subsidiaries.

G. M. Divisions Gain 21 to 35%

Chevrolet Has Largest Unit Gain and Olds Leads in Percentage

NEW YORK, March 8 — General Motors pamphlet report for the year 1926, just issued, shows new records in number of cars manufactured and sold, not only for the corporation as a whole but for each of the car manufacturing divisions. The statement of earnings and balance sheet position in the report is identical with the preliminary statement issued previously.

Hitherto unpublished, however, are the figures of sales by divisions, which follow:

Passenger Cars	1926	1925	1924
Buick	280,000	208,575	166,952
Cadillac	27,489	22,773	17,905
Chevrolet	620,364	466,485	295,456
Oakland	58,537	45,380	36,512
Pontiac	75,836	....	....
Oldsmobile	59,536	43,935	45,728
Commercial Cars			
Chevrolet	111,781	45,824	19,277
Pontiac	1,298	....	....
Totals:			
Passenger	1,121,771	787,148	562,553
Commercial	113,079	45,824	19,277
Miscellaneous*	....	2,930	5,511
Grand total	1,234,850	835,902	587,341

* Miscellaneous includes GMC Trucks to end of April, 1925, when GMC Truck Division was transferred to Yellow Truck & Coach Mfg. Co., the operations of which are not consolidated in the accounts of General Motors Corp.; also cars, trucks and tractors not now manufactured.

A notable feature of the sales by divisions is that while in units the remarkable gain by Chevrolet exceeded the total of all others, each of the cars showed a striking percentage gain over 1925. Oldsmobile was the leader, with an increase of 35 per cent; Buick closely followed, with 34 per cent; then came Chevrolet, 33 per cent; Oakland, 29 per cent, and Cadillac, 21 per cent.

Commenting on the corporation's dollar volume of sales in 1926, which amounted to $1,058,153,333, Alfred P. Sloan, Jr., president, says:

Check on Stocks Profitable

"Sales for the year approximate the aggregate sales for the entire first 10 years in the corporation's history. Stocks of cars in the hands of the corporation, its dealers and distributors at the close of the year were normal. The policy of the corporation regarding stocking dealers with cars has been rigidly adhered to, with profit both to the corporation's dealer organization and to the corporation itself."

Reviewing the year in foreign business, the report says:

"Five assembly plants were installed in Australia, at Adelaide, Brisbane, Melbourne, Perth and Sydney; an assembly plant was installed at Montevideo, Uruguay; a warehousing operation was started in Alexandria, Egypt, and new assembly operations have been authorized at Osaka, Japan; Batavia, Java, and Stockholm, Sweden."

Sales of cars and trucks overseas by the export organization of General Motors follow:

Year Ended Dec. 31	Cars and Trucks Number of Units	Value Wholesale
1922	21,872	$19,875,015
1923	45,000	39,193,869
1924	64,845	50,929,322
1925	100,894	77,109,696
1926	118,791	98,156,088

With regard to the Yellow Truck & Coach Mfg. Co., the report says: "The earnings of the company for the year have been unsatisfactory. This resulted from several different causes—principally the necessity of revamping and reconstructing the plants and products."

G.M.C. EARNINGS EXCEED STEEL 30%

NEW YORK, March 9—That General Motors Corp. has now outdistanced United States Steel Corp. in earning power is shown by comparison of the annual statements.

For 1926, General Motors earnings after charges and taxes were $186,231,182 against United States Steel earnings before interest of $143,342,054, a difference in Motors favor of $42,889,128 or 30 per cent.

General Motors market value now closely approximates that of United States Steel, standing at about $1,631,466,000 against $1,784,053,000.

Dow, Jones & Co. estimates that average invested capital of United States Steel in 1926 was $2,166,080,905, while General Motors average investment was $560,636,871.

Sales earnings were equal to about 6.26 per cent of invested capital for United States Steel, while General Motors earned 33.22 per cent.

Federal Promotes Rogers

DETROIT, March 9—C. A. Rogers was named treasurer of the Federal Motor Truck Co. at the annual meeting this week, succeeding E. P. Hammond. Mr. Rogers previously was assistant treasurer. Besides being reelected assistant secretary, R. W. Ruddon was also named assistant general manager of the company. The following were elected directors: T. E. Reeder, M. L. Pulcher, E. P. Hammond, C. F. Mellish, Dr. W. E. Rice, F. H. Wheldon, W. E. Metzger, H. H. Smith and C. A. Rogers. Officers besides the above mentioned are T. E. Reeder, chairman of the board; M. L. Pulcher, president, and C. F. Mellish, secretary.

Financial Notes

Electric Storage Battery Co. and Willard Storage Battery Co. for 1926 report profit of $6,733,781 after expenses and charges but before Federal taxes. Deducting estimated Federal taxes of $865,000, balance is equal to $7.30 a share earned on the combined 802,955 shares of common and preferred stock, comparing with $8,626,105 after taxes equal to $9.43 earned on 799,173 shares outstanding in 1925. The two stocks share alike as to dividends of 25 cents a share which have been paid on both issues. Consolidated balance sheet as of Dec. 31, 1926, reveals an exceptionally strong position with cash and marketable securities totaling $8,596,382. Current assets were in nearly a ten to one ratio to current liabilities.

Curtiss Aeroplane & Motor Co., Inc., reports net profit of $413,316 after interest, Federal taxes, etc., for 1926, equivalent in the participating provisions of the stocks to $7.97 a share earned on 25,231 shares of 7 per cent preferred stock and 97 cents a share on 218,000 no par shares of common stock. This compares with $150,149, or $5.95 a share, on preferred stock in 1925.

A. O. Smith Corp. reports net profits of $1,607,849 for the six months ended January 31, 1927, after allowance for interest and taxes. Surplus as of that date was $7,616,770 after payments of $257,949 in dividends. Current assets of $9,425,310 were shown as against $5,259,721 in current and accrued liabilities.

Seek Wide Market for Ethyl Gasoline

NEW YORK, March 9—Etyhl Gasoline Corp., after nearly a year of preparation, has attained distribution of its product in nearly every state of the country, as well as in Canada, and is now embarking on a program of intensive development of the market.

Companies already licensed to mix Ethyl fluid with gasoline at their refineries and to sell to the trade and public total 19, and a number of others are being added to the list.

Investigations made by the engineers of the corporation into fuel problems, facts about Ethyl gasoline and how it has won the approval of public health authorities and other data have been incorporated into a non-technical "primer," which is to be broadcast to all interested from the offices at 25 Broadway.

Companies now licensed include Associated Oil Co., Atlantic Refining Co., Beacon Oil Co., Continental Oil Co., Humble Oil & Refining Co., Imperial Oil Co., Ltd. (Canada), Pennzoil Co., Refiners Oil Co., Spears & Riddle Co., Spokane Oil & Refining Co., Standard Oil Co. (Indiana), Standard Oil Co. (Kentucky), Standard Oil Co. of Louisiana, Standard Oil Co. of Nebraska, Standard Oil Co. (New Jersey), Sterling Oil Co., Union Oil Co. of California, Walburn Petroleum Co., and Waverly Oil Works.

Automotive Steels Continue Steady

Buying Holds in Fair Amount With Prompt Deliveries Important Factor

NEW YORK, March 10—A fair amount of buying by automotive consumers continues to be noted in the steel products market. A large part of this business carries with it requests for prompt shipment but so far mills seem to encounter little difficulty in complying with all of these requests. Mahoning Valley rollers of full-finished automobile sheets enjoy a satisfactory rate of operations. The market for full-finished body stock holds firm at 4.15 cents, Pittsburgh base, but buyers look for strictly prime material at that price.

Non-integrated sheet-rollers are still able to buy their semi-finished material at $34, and on the whole they fare about as well in the present market as secondary products mills do generally. Rumors continue that the merger of Ohio sheet mills is to be attempted all over again. The larger sheet-rolling interests are rather anxious that such a combination of the smaller units materialize. It is natural that when demand begins to lag, the smaller producers take the lead in offering concessions to consumers, and at times this has led to a demoralization of the market which continued long after the demand had begun to pick up.

The black sheet situation is chiefly affected by the stiff competition offered by strip-steel mills, capacity of which is steadily expanding. The market for black sheets has suffered no setback, however, in the last few days, while that for strip-steel has grown firmer. Cold-bar finishers have booked considerable additional automotive business.

Alloy Operations Broader

Manufacturers of automotive alloy steels have also been able to broaden operations, a very good demand being noted for 3½ per cent nickel-steel and for chrome-nickel steel.

Pig Iron—Following heavy sales to automotive foundries, Cleveland furnaces advanced their prices another 50c per ton. Most of the furnaces are not very eager to commit themselves for heavy tonnages at this time.

Aluminum—The market is steady and fairly active, but automotive consumers proceed rather cautiously. Thanks to the activities of the European aluminum cartel, the London market is now pegged at £105 per gross ton.

Copper—Both raw metal prices and those for automotive copper and brass products have been revised upward. The tone of the market is firm.

Tin—Not much change in prices is noted. Spot metal is closely held.

Lead—Storage battery manufacturers bought moderately before the last advance. Demand from pigment manufacturers was chiefly responsible for the rise.

CONGRESS VOTES 96 PRIVATE BRIDGES

WASHINGTON, March 10—A total of 265 private bridge bills, of which 96 were passed, were introduced during the 69th Congress. These bills give concessions to private interests who are allowed to build the bridge at private cost, and tax motorists for use. There was evidence of a growing sentiment against the passage of the bills during the last Congress because of the monopoly and tax they impose on the motorist. During the hearing of one bill it was testified that $100,000 had been paid by a bridge company to the private party who had secured the concession—secured without the investment of any money at all in the project.

Excise Tax Shows $6,740,950 Drop

WASHINGTON, March 6—Excise taxes collected from the automobile industry during January totaled $2,661,866 compared with $9,402,816 in January, last year, according to Internal Revenue Bureau receipts announced by the department. Collection from the automobile industry for the first seven months of this fiscal year totaled $39,868,000 compared with $70,822,000 collected in the first seven months of the last fiscal year.

The total Federal tax collected in January was $92,478,936 of which 2.8 per cent was collected from the automobile industry, compared with 9.3 per cent collected from the industry in January, 1926.

The January tax collection from tires, parts and accessory manufacturers and from truck manufacturers this year was nil, compared with $1,525,577 collected January, 1926, from the parts manufacturers, and $542,000 collected from the truck manufacturers.

Gasoline Stocks Gain

NEW YORK, March 9—January domestic demand for gasoline was 17,888,000 bbl. representing a 17 per cent decline from December but slightly above the demand a year ago, according to Bureau of Mines figures. Production in January was 27,960,000 bbl. against 27,498,000 bbl. in December. Stocks of gasoline at the end of January total 46,058,000 bbl. against 39,023,000 bbl. on Dec. 31, an increase during the month of 7,035,000 bbl.

Arrow Head Adds Equipment

MINNEAPOLIS, March 7—The Arrow Head Steel Products Co., manufacturer of pistons and automotive parts, is installing additional machinery and manufacturing equipment to take care of its increased production which now requires 24-hour operation.

Jordan Shows Gain in Ratio of Assets

Finds Outlook for 1927 Improved by Addition of New Small Car

CLEVELAND, March 5—The annual report of Jordan Motor Car Co., Inc., shows the company to be free of all bank loans and other indebtedness aside from current bills which have been discounted. The company had current assets of $1,429,129 against current liabilities of $421,657, a ratio of 3.3 to 1, comparing with 1.9 to 1 a year ago.

During the year several items were charged off which previously had been carried as deferred, in addition to providing from surplus a reserve for contingencies. The reduction in surplus is accounted for almost entirely by the substantial decrease in deferred items which amounted to $397,287 in 1925 as against $131,897 in 1926.

Referring to the company's position, E. S. Jordan, president, said:

"During the latter half of 1926 the Jordan company in common with others, suffered a falling off in sales due to a general overproduction in the industry. At the same time there was an inclination on the part of buyers to await the appearance of the new Jordan line about which information had been circulated prematurely.

Now Building 40 Daily

"With the factory now operating at the rate of 40 cars daily, and with the demand for the new Jordan line promising much larger production later, the directors decided to begin the new year in a financial position not only free from all loans and other indebtedness, but to also charge off items which previously had been carried as deferred.

"The eight-cylinder car, which has been the most satisfactory we have ever produced, will be continued as the top of the line, while the new little custom Jordan will give us greatly added volume."

Reduces Airline Fare

DETROIT, March 3—A reduction of $2 in the one-way fare of the Grand Rapids-Detroit airline has been made effective by Stout Air Services, Inc. This is the second reduction since the inauguration of this line seven months ago, the original charge being $25 one way. The new rate is $16.

P.R.T. Shows Bus Deficit

PHILADELPHIA, March 8—Philadelphia Rapid Transit Co. reports a deficit of $274,247 resulting from bus operations in 1926, a loss mainly due, the company said, through giving service in districts where it is needed but which will be unprofitable for years to come. Service in these districts by street cars, the company said, would have been impossible.

Used Truck Values Reduce White Net

Profit in 1926 is $2,566,290 With Gross Sales Increased to $64,578,088

CLEVELAND, March 8—Net earnings of White Motor Co. in 1926 were $2,566,290 as against $5,276,245 in 1925. Gross sales in 1926 were $64,578,088 as compared with $57,673,594 in 1925. The decline in earnings was ascribed by Walter C. White, president, to the overvaluing of used trucks taken in exchange and to heavy credit losses in two localities. Despite this situation, he said, the company maintained and extended its trade outlets and in other ways promoted its future growth.

Current assets totaled $35,487,302 and total assets $54,115,767. Current liabilities totaled $4,023,645. Current assets show cash of $2,329,257; notes receivable $5,425,424; accounts receivable $5,884,882 and inventories $21,573,948. Current assets in 1925 showed cash $1,723,994; notes receivable $3,713,890; accounts receivable $6,568,577, and inventories $16,662,833. Total current assets in 1925 were $30,853,229 against current liabilities of $5,400,069.

The company reported 83 branches in operation at the close of the year, with a large number of dealers operating under the branches.

Electric Auto-Lite Shows $2,040,894 Net Profits

TOLEDO, March 7—Gross sales of $11,726,310 in 1926 as compared with $12,489,382 for 1925 enabled the Electric Auto-Lite Co. to show $2,040,894 profits before Federal taxes last year as compared to $2,526,902 for the previous year, according to the annual report submitted to stockholders by C. O. Miniger, president.

The record of last year is considered good due to the fact that it was a reconstruction year with the company during which the plant layout here and at Fostoria was enlarged and changed and the starting, lighting and ignition business of the American Bosch Magneto Corp. purchased and merged into the plant here.

This year should see a new high records in sales, production and earnings, Mr. Miniger said.

Adopts Obsolescence Plan

DETROIT, March 8—National Standard Parts Association is instituting an obsolescence exchange plan for its manufacturer members which will provide jobbers with quicker service on obsolete numbers. A master list has been compiled on piston pins and inventories on these will be submitted quarterly by piston pin manufacturer members, thus making it unnecessary for makers to resume production frequently to supply a limited demand.

MICHIGAN TO VOTE ON UNIFORM LAW

DETROIT, March 7—A bill has been introduced in the Michigan Legislature by Representative Joseph Warner of Ypsilanti which would amend the Michigan motor vehicle law to make it conform with the Hoover uniform code proposal. The bill takes the portion of Act 302 which has to do with the regulation of motor vehicles, including taxation thereof, and revises it so that it is similar to the codes of other states adopting these uniform laws. The bill has been referred to the committee on roads and bridges in the House.

U. S. Rubber Shows $17,928,750 Income

NEW YORK, March 7—Net income of United States Rubber Co. for 1926 was $17,928,750 before interest charges and allowance for depreciation but after all other charges. This compares with $25,038,305 in 1925. Sales in 1926 totaled $215,528,309 as against $206,473,737 in 1925. Reductions in selling prices owing to decline in crude rubber prices affected profits adversely, C. B. Seger, chairman of the board, said in his report to stockholders.

In view of the continuing uncertainty of crude rubber prices, the company has set aside the entire amount of its net surplus earnings, $8,535,380, as a reserve against inventories. This net surplus earnings included $6,000,000 representing net profit of the rubber plantations in 1926.

The balance sheet shows current assets of $153,958,810 and total assets of $355,832,497. Current liabilities total $33,671,657. Inventories of finished goods totaled $48,456,221 and inventories of materials and supplies, $46,491,575. Inventories at the end of 1925 totaled $80,621,793. Total current assets in 1925 were $154,129,757 and current liabilities, $30,728,957.

Illinois Sales Improve

CHICAGO, March 1—New car sales for February in Illinois totaled 11,583 against 14,368 in February, 1926, and 9495 in January, 1927, according to registration figures compiled by Robinson's Advertising Service. Ford is given a total for February, 1927, in these tables of 1646 and Chevrolet 3225 whereas in February, 1926, these tables gave Ford 3254 and Chevrolet 1845. Generally speaking the February decrease was well distributed.

Willys Sets 30,000 Mark

TOLEDO, March 9—Production of Whippet and Willys-Knight cars in March will approximate 30,000, bringing total production of the first quarter to a point compatible with the 300,000 schedule set for the year.

Chrysler Profits Total $15,448,586

Compares With $17,126,135 in Year Previous — Exports Yield 10.29% of Sales

DETROIT, March 7—Net profit of the Chrysler Corp. for 1926 totaled $15,448,586 as against $17,126,135 in 1925. Cars sold during the year totaled 170,392 which compares with 137,668. In the final quarter of the year, the company showed net profit of $3,728,775, comparing with $3,873,868 in the preceding quarter. The 1926 earnings were equal to $5.07 a share on common stock as against $5.67 in 1925.

In his statement to stockholders, W. P. Chrysler, president, pointed out that during 1926 $8,551,768 was spent on gross additions to capital assets. The net increase in permanent assets was $3,941,198. All expenses incidental to creating new lines have been written off against the year's profit. The net working capital position of the company compared with 1925 has improved by $293,641, notwithstanding the declaration of $9,846,828 in dividends, the expenditures for plant, retirement of $1,024,000 of funded debt, and meeting preferred stock sinking fund retirement of $812,124.

Export business in 1926 totaled 10.29 per cent of the total business volume, Mr. Chrysler said, comparing with 8.28 in 1925 and 5.42 in 1924. Strong sales representations have been developed in all principal world markets and export business promised continued gains in importance. Arrangements for export assembly in Germany and Australia are now being made, Mr. Chrysler said.

The company shows current assets of $40,208,558 against current liabilities of $11,893,785, leaving a net working capital of $28,314,773 against $28,021,130 at the close of 1925. Cash on hand was $8,500,427 against $4,643,101. Inventories increased from $14,812,835 to $16,417,102. The funded debt was $1,684,000 against $2,708,000 in 1925.

Pierce-Arrow Reports $1,267,695 Net in 1926

NEW YORK, March 5—The annual report of the Pierce-Arrow Motor Car Co., and the Pierce-Arrow Sales Corp. for 1926 shows net income of $1,267,695 after depreciation, interest, Federal taxes, etc., equivalent to $12.67 a share on $10,000,000 outstanding 8 per cent cumulative preferred stock and back dividends of approximately 40 per cent. Allowing only for the regular annual 8 per cent dividend requirement on the preferred the balance is equal to $.142 a share on 328,750 no par shares of common stock. This compares with $1,629,781, equivalent after prior preferred dividends to $15.46 a share on the preferred and $2.26 a share on the common in 1925.

Reeves Commends Industry Papers

BOSTON, March 8—Declaring that the automobile industry could not have been brought to its present position of leadership without advertising, Alfred Reeves, general manager of the National Automobile Chamber of Commerce, speaking today before the Boston Advertising Club, had a special word of commendation for trade paper advertising.

After pointing out the field and uses of newspaper and general medium advertising, Mr. Reeves said:

"One field of advertising which is too often neglected is that of the trade papers. Show me an industry which has successful business publications, and I can tell you without any further evidence that that industry is a successful one. I know of no business which has a better line of trade papers than the automobile industry. They are well edited, well printed, well merchandised and they have a high standard of ethics."

In another address today before the Boston Automobile Dealers Association at the Copley-Plaza, he said that while he did not believe 1927 would be a boom year he saw no reason why prosperity should not continue and why automobile production should not be as big as last year, or approximately 4,450,000 units, of which 600,000 will go to foreign countries.

Boston Finds Sales Slow

BOSTON, March 8—Attendance at the Boston automobile show is holding up better than a year ago, and Manager Chester I. Campbell states that it will set a new record for visitors. The free list by the dealer has been abandoned for the past two shows. Visitors are interested in the cars but they have been shopping more than buying since the show opened. Sales are being made but not in the volume that the dealers and salesmen as a whole expected.

Coming Feature Issues of Chilton Class Journal Publications

May 1 — Automobile Trade Journal—Annual Big Small Town Market Number.

May 5 — Motor Age — Annual Sales and Service Reference Number.

Toledo Plants Exceed 1926 Employment Rate

TOLEDO, March 7—Automotive plants in Toledo are now at a new peak of employment, it is indicated by the weekly report showing 51 plants employing 30,795 workers as against 26,075 a year ago. This is the highest point reached in five years.

Willys-Overland is going forward on a schedule of 30,000 motor cars for March which is a 60 per cent gain on February production and 80 per cent better than last March. Willys-Knights make up 40 per cent and Whippets 60 per cent of the current month's schedule.

The Chevrolet Ohio Motor Co. is turning out 5000 completed transmission sets every day furnishing both Chevrolet and Pontiac factories with these units.

Champion Spark Plug Co., Mather Spring Co. and Tillotson Mfg. Co. are also working on high production schedules.

Malleable iron plants have been receiving increased orders.

Briggs Orders at Peak

DETROIT, March 10—Briggs Mfg. Co. reports orders now booked as 40 per cent in excess of any former peak period. Because of pressure of business the company is undertaking an expansion program which will increase its capacity to 1000 bodies a day. A new five-story building 100 x 800 ft. now under way will make 12 acres of additional space available June 1.

Tire Production Shows 20% Gain

AKRON, March 9—Improvement in the rubber and tire industry has been rapid during the past few weeks. Early March production schedules of most Akron rubber companies are from 20 to 30 per cent above those in effect at this time last year. Tire output figures in the district are much higher than they have been in many months. Estimates place current production between 135,000 and 140,000 casings and about 170,000 tubes a day.

Dealers are ordering heavily, in anticipation of a big spring business. Prices of tires are at bottom levels, it is believed, and the recent upward tendency in the crude rubber and cotton markets has encouraged buyers to replenish depleted stocks.

The Goodyear Tire & Rubber Co. is producing 57,000 tires a day, according to officials. Sales have been greatly stimulated, it is said, by announcement of the company's new balloon tire.

Output of close to 40,000 tires a day is reported at the Firestone plant and about 25,000 at Goodrich. Capacity operations are announced at the Miller, General and Seiberling plants.

Firestone is building an addition to its Plant 2, devoted exclusively to small size tires.

A $700,000 addition is being completed by Seiberling at Barberton.

Rubber Price Rises

NEW YORK, March 8—Rise of crude rubber last week, bringing spot prices close to the 40-cent level, was no surprise to the market as the prospect of further restriction, beginning May 1, has become stronger. The London average spot price from Feb. 1 to March 2 was 19.077 pence. An average of 22.041 pence must be maintained during the remainder of the quarter to raise the average to 21 pence and avoid restriction to 60 per cent of standard production, according to Henderson, Helm & Co.

Calendar of Coming Events

SHOWS

Barcelona .....April 27-May 8
Budapest .....June 4-15
Cleveland .....Sept. 19-23
Exposition, Public Auditorium, National Machine Tool Builders' Ass'n.
Cleveland .....Oct. 3-7
Exhibition Public Auditorium, American Electric Railway Ass'n.
Cologne .....May 20-31
International Commercial Transport Exhibition.
London .....Oct. 14-22
Olympia Passenger Car Show.
London .....Nov. 17-26
Olympia Truck Show.
New Haven, Conn. .....Sept. 6-9
Machine Tool Exhibition.
Paris .....Oct. 6-16
Grand Palais.
Riga .....April 10-17

CONVENTIONS

American Electric Railway Association, Public Auditorium, Cleveland..Oct. 3-7
American Gear Manufacturers Association, Annual Meeting, Hayes Hotel, Jackson, Mich. .....May 12-14
American Society of Mechanical Engineers, White Sulphur Springs, W. Va. .....May 23-26
American Welding Society, Engineering Societies Bldg., New York City .....April 27-29
Automotive Equipment Association Summer Convention, Multnomah Hotel, Portland, Ore...June 27-July 2
National Association of Automobile Show and Association Managers, Drake Hotel, Chicago .....July 26-27
National Foreign Trade Council, Detroit .....May 25-27
National Safety Council, Stevens Hotel, Chicago .....Sept. 26-30
Tire and Rim Association of America, Inc., Annual Meeting, Cleveland..April 15

S. A. E.

Detroit, March 24—Artificial Leather and Rubberized Fabrics—By E. H. Nollau and Mr. Nickowitz.
French Lick Springs, Ind., May 25-28—Summer Meeting.
Metropolitan, March 17—Trucks—By chief engineers of truck manufacturing companies.
Washington, March 18—Air Transport Dinner. Air Transport in Europe—By Major Lester D. Gardner.

RACES

Abilene, Texas .....July 4
Altoona, Pa. .....June 11
Altoona, Pa. .....Sept. 5
Atlantic City .....May 7
Atlantic City .....Sept. 24
Belgian Grand Prix, Spa-Francorchamps .....July 9-10
British Grand Prix, Brooklands.....Oct. 1
Charlotte, N. C. .....July 18
Detroit .....Sept. 10
French Grand Prix, Montlhery.....July 3
Indianapolis .....May 30
Los Angeles .....Nov. 27
Salem, N. H. .....June 25
Salem, N. H. .....Oct. 12
Syracuse, N. Y. .....Sept. 3
Targa Florio, Sicily.....April 24